GREAT LAKES ARCHAEOLOGICAL RESEARCH CENTER, INC.

Reports of Investigation No. 139

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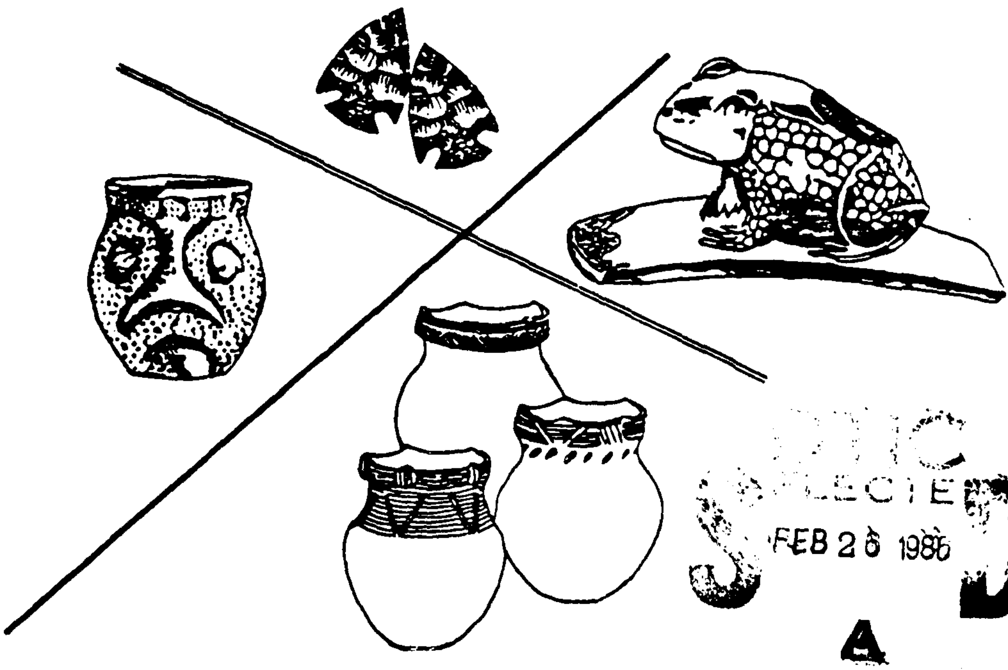
ARCHAEOLOGICAL RECONNAISSANCE SURVEY OF POOL 10, UPPER MISSISSIPPI RIVER, GRANT AND CRAWFORD COUNTIES, WISCONSIN, AND ALLAMAKEE AND CLAYTON COUNTIES, IOWA



WAUKESHA, WISCONSIN

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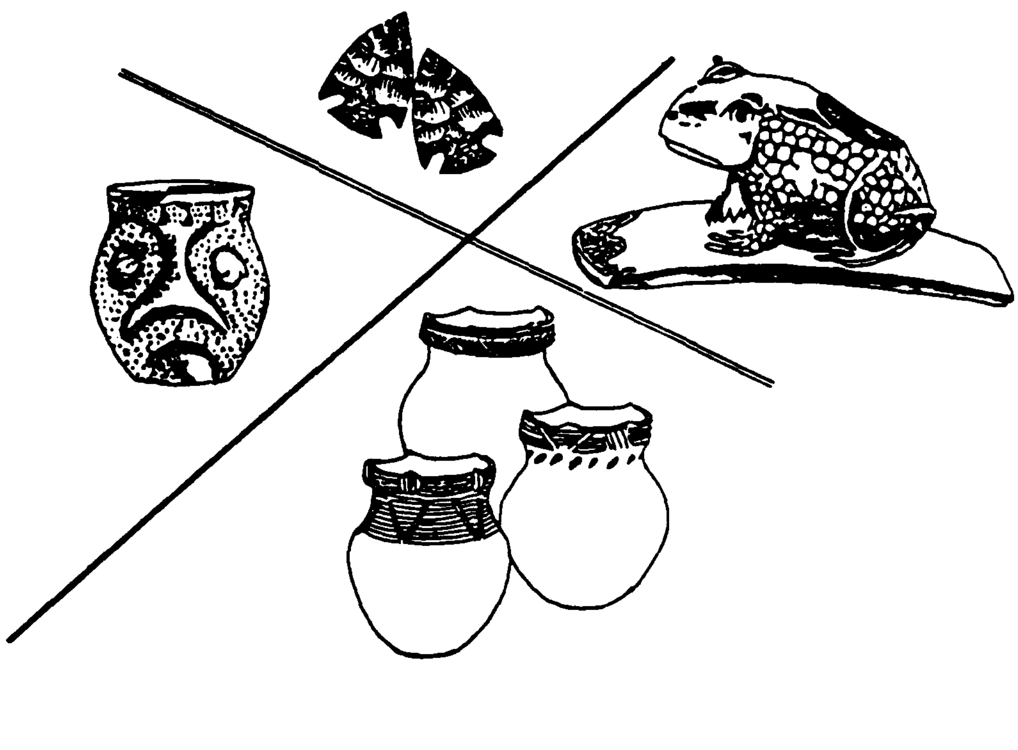

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ARCHAEOLOGICAL RECONNAISSANCE SURVEY OF POOL 10, UPPER MISSISSIPPI RIVER, GRANT AND CRAWFORD COUNTIES, WISCONSIN, AND ALLAMAKEE AND CLAYTON COUNTIES, IOWA.

Submitted To: St. Paul District, Department of
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In Compliance With: Contract No. DACW37-82-M-2078
October, 1984

MANAGEMENT SUMMARY

This report entitled "Archaeological Reconnaissance Survey of Pool 10, Upper Mississippi River, Grant and Crawford Counties, Wisconsin, and Allamakee and Clayton Counties, Iowa" was sponsored by the St. Paul District, U.S. Army, Corps of Engineers. In part, the investigations fulfill St. Paul District obligations mandated by the National Environmental Policy Act of 1969 (P.L. 91-190), National Historic Preservation Act of 1966 (P.L. 89-665) as amended, Protection and Enhancement of the Cultural Environment (E.O. 11593), Advisory Council's Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800), Preservation of Historic and Archaeological data 1974 (P.L. 93-291), and Corps of Engineers Identification and Evaluation of Cultural Resources (E.R. 1105-2-50).

The reconnaissance was undertaken for several specific reasons. First, additional data with regard to the geomorphic contexts of archaeological sites were sought for purposes of integration within a recent geomorphic study of the navigation pool (Church 1984). Secondly, the development of a preliminary predictive model was desired to assist the St. Paul District in the performance of planning, regulatory, and operation and maintenance functions within Pool 10. This model is to be applied to the determination of needs for further study, the adequacy of future survey methods and techniques, and the impacts on cultural resources from multiple use activities which include commercial navigation, recreational use, and wildlife habitat maintenance and improvement.

The reconnaissance study resulted in the identification of deeply buried archaeological sites and refinement of our understanding of buried Holocene landscapes. Several of these landscapes and associated archaeological sites can now be relatively dated. However, a serious limitation of the study is the lack of precise Holocene chronology of both occupation sites and landscapes. If future efforts are directed toward such refinement through deep excavation of selected sites, understanding of sediment geomorphology and cultural occupation of buried landscapes will be greatly enhanced.

Of additional significance are the implications raised by this study for past and future surveys. Prior to these investigations, survey and testing operations had not been focused on the identification of Early and Middle Holocene surfaces. As a result, survey results are incomplete. Previous work did not address the discovery of deeply buried archaeological sites. This reconnaissance has revealed components buried by as much as 15 feet of recent (Holocene) alluvium. If future investigations are to be reliable deeply buried sites and their associated geomorphic contexts must be considered.

Records, photographs, profiles, plan views, and artifacts are currently housed at Great Lakes Archaeological Research Center, Inc. The center can be contacted by mail at the following address: Great Lakes Archaeological Research Center, Inc., 7509 West Harwood Avenue, Wauwatosa, WI 53213, or, by phone at (414) 259-6020.

ABSTRACT

During the late summer and fall of 1983, Great Lakes Archaeological Research Center, Inc., conducted an archaeological reconnaissance study of Navigation Pool 10, Upper Mississippi River. In the most general sense, the investigations were directed to resolving both management and research questions relating to the lowland floodplain. A geomorphic study of the floodplain had recently been completed by the Army Corps of Engineer's Waterways Experiment Station, Vicksburg, Mississippi (Church 1984). More specifically, this investigation sought to determine the relationships between geomorphic development of the floodplain and the location of archaeological sites, including an assessment of the potential for encountering deeply buried sites.

Owing to the unique environmental factors, various remote sensing techniques such as ground penetrating radar and seismic refraction were utilized as adjuncts to more traditional survey and testing techniques. These latter techniques included coring and auger investigations with hand tools to a depth of 15 feet, cut-bank surveys, test excavations, and historic mapping procedures.

Nine previously unrecorded sites were documented, two sites were investigated with test excavations, and 4 buried components, three of which were present at previously recorded sites, were identified. The nature and depth of Pleistocene-Holocene contacts, post-glacial clay deposits, depth of historic alluvium, and other geomorphic features were investigated at several locations.

The results of archaeological reconnaissance, dovetailed with the geomorphic studies, are significant. Buried components have been identified at several locations, multiple landscapes are now known to exist within the Holocene floodplain matrix, and relative chronologies can be derived from both archaeological and geomorphic features. The primary limitations of the study are derived from imprecise knowledge of the absolute chronology of buried landscapes and archaeological deposits. It is recommended that these limitations be resolved by block excavations at selected localities in Navigation Pool 10. A preliminary predictive model for site location, based on defined geomorphic features is submitted.

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INTRODUCTION:

Almost a century ago prehistorians began to record "Indian Mounds," those most visible remnants of past cultures in the Upper Mississippi Valley. At that time, investigators such as Cyrus Thomas (1894) Theodore Lewis and Alfred Hill (Lewis 1885a, 1885b) reported the results of survey and excavation of many earthworks clustered along the blufftops. Only quite recently have archaeologists begun to focus on the least visible evidence of prehistoric occupation in the Upper Valley--the living surfaces utilized by past populations now deeply buried in the sands and silts deposited by the Mississippi River and its tributaries. While logic may have dictated that such sites were likely situated in the deep sediments of the lowland floodplain, logistical difficulties posed a serious deterrent to archaeological investigations. Further, geological and geomorphological studies were limited both in number and detail. This report details the results of archaeological reconnaissance performed subsequent to a geomorphic study of the floodplain of Navigation Pool 10.

The floodplain in Navigation Pool 10 is bordered on its lateral margins either by sandy terraces composed of Pleistocene outwash materials consisting of coarse sediments, e.g., sands and gravels, or by steep bedrock walls. In the former instance the demarcation is subtle and discontinuous, while in the latter, the margin between floodplain and valley wall is discrete and dramatic. Dependent on the fluctuations in pool level, approximately 50% of the surface area of the pool is fast land. The remaining 50% is comprised of the main channel, side channels, sloughs, ponds, backwater lakes, swamps, and marshes. Dominant tree cover on the islands and terrace margins reflects recent historic trends with silver maples, poplars, and willows predominant. Oaks, Elms, Birch, and other hardwoods are few in number having been decimated in recent historic times. Understory vegetation is particularly noxious with luxurious communities of poison ivy and stinging nettle in most localities. Generally, the landscape of the floodplain can be described as ridge and swale topography, the swales periodically, and in some instances permanently, filled with water. Access to the landforms on the floodplain can only be effectively attained by boat.

This archaeological reconnaissance survey was implemented by the St. Paul District, Corps of Engineers as part of the District's Operation and Maintenance Program for the 9-foot Navigation Channel on the Upper Mississippi River. As such, the study results were anticipated to serve several functions. Paramount among these functions was the

application of the study as a planning tool to aid in the preservation and protection of the Nation's cultural heritage. Specifically, the study is to be employed in the determination of needs for further archaeological survey work, the adequacy of future methods and techniques of survey, and to assess impacts on cultural resources during the performance of planning, regulatory, operation, and maintenance functions within the navigation pool. The scope of work which functioned as a guide to several tasks and objectives is attached to this report and is identified as Appendix A.

Study Locality:

The reconnaissance survey was conducted within the limits of Navigation Pool 10. This pool is the second longest in the St. Paul District extending from lock and dam 9, approximately 3 miles south of Lynxville, Wisconsin (RM 615.1) to lock and dam 10 at Guttenberg, Iowa (RM 647.9). Navigation Pool 10, depicted in Figure 1 embraces parts of Grant and Crawford Counties in Wisconsin, parts of Clayton and Allamakee Counties in Iowa. The pool has a reach of 32.8 miles and approximately 110 miles of shoreline. Church (1984) have subdivided Navigation Pool 10 into two distinct units which are separated by the alluvial fan of the Wisconsin River. The authors note:

> North of the confluence with the Wisconsin River the flow of the water is subdivided into one or two major channels. A large portion of the exposed land (above normal pool elevation) in this reach of the Mississippi floodplain is composed of ridge and swale topography indicative of formation by lateral accretion of channel deposits during floods. Much of the ridge and swale topography can be associated with lateral migration of minor channels, rather than major channels. Ridges have been built along major channels but lateral migration of these channels to form extensive areas of ridge and swale topography has been limited. Numerous lakes and poorly drained depressions occur in swales and behind ridges formed by the lateral accretion of sediment by two adjacent channels. The channel slope in this reach, based on low water stages observed in 1930, was 2.5 in./ mile (data extracted from USACE, 1929-1930). This gradient approximates the slope of the valley floor (Church 1984: 25-26).

Of the second division they state:

> At the confluence with the Wisconsin River, the Mississippi floodplain is dominated by the Wiscon-

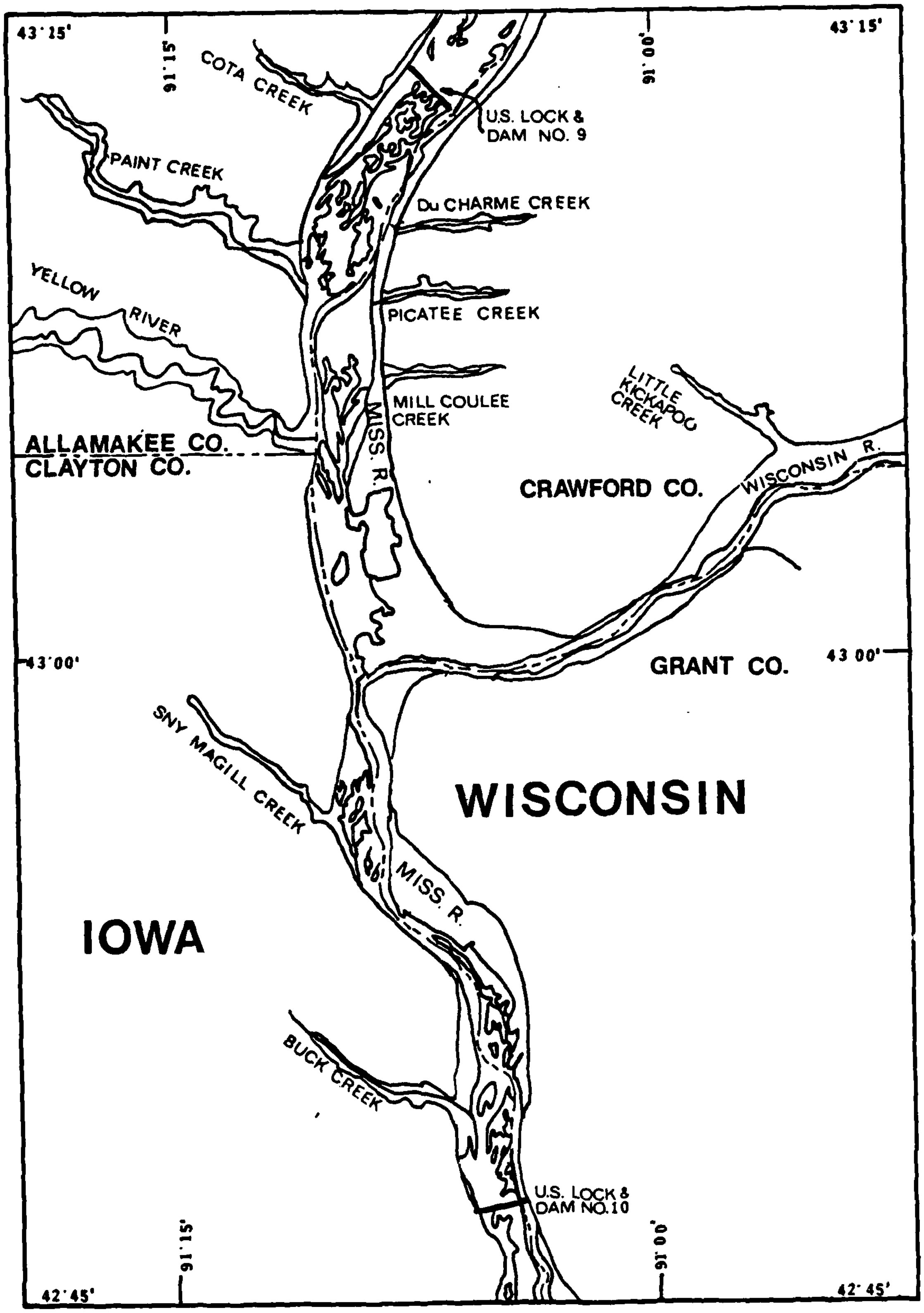


Figure 1: Navigation Pool 10, Upper Mississippi River.

sin River alluvial fan which is maintained by the high sediment discharge of the the Wisconsin River. The Mississippi River is forced into one narrow and deep major channel along the western valley wall. This channel configuration is a relatively common occurrence on the Upper Mississippi River indicating that more sediment is supplied from major tributary rivers than can be carried away by the Mississippi.

The influence of the introduction of this predominantly sand sized sediment can also be seen in much of the reach of the Mississippi River below the Wisconsin River by its much smaller number of meandering minor channels. Many minor channels do exist in the Mississippi Valley reach below the Wisconsin fan but they tend to be straighter and more parallel to the major channels. Ridge and swale topography is less well developed and, as a consequence, lakes are not as abundant. Though nearly absent in the northern reach, mid-channel bars and islands are common in this southern reach. Much of the expo
These differences can be explained by the sediment influx from the Wisconsin River. Deposition of this sediment has increased the slope of the southern segment and reduced the slope of the northern segment. Large supply of noncohesive sand has inhibited the progressive lateral migration of channels and the construction of ridge and swale topography. The irregular growth of islands and bars has been a more important process in the southern reach of the Mississippi River in Pool No. 10 (Church 1984: 26-27).

A third locality, although not identified by Church (1984), is noteworthy. In the upper portions of the pool, adjacent to the Harper's Ferry Terrace (ca. RM 641-RM 652), abandoned channels, minor channels, sloughs, backwater lakes and ponds are abundant. In terms of complexity, this reach of the Mississippi River is similar to the reach south of the Wisconsin River confluence although it is still an anastomosing channel pattern (see Church, 1984: 25-27). Detailed maps adapted from U.S.G.S. 7.5' quadrangles (1:24,000) are attached as Appendix B.

Contractor:

Contractor for this study is Great Lakes Archaeological Research Center, Inc. Dr. David F. Overstreet served in the capacity of principal investigator for the project, Mr. John Wackman, Mr. Paul Lurenz Jr., and Mr. James Clark Jr. functioned as field crew and were assisted on a volunteer basis by Mr. Alfred Reed of Prairie du Chien. Remote sensing survey was directed by Ms. Joan Underwood, Donohue & Associates Inc., Waukesha, Wisconsin who supervised Donohue & Associates personnel in the field. Field investigations were conducted during August, September, October, and November 1983. Analyses and report preparation was conducted during December 1983, January, February, and March, 1984. A total of 239 man-days were expended during the course of the investigations. Great Lakes Archaeological Research Center, Inc., 7509 West Harwood Avenue, Wauwatosa, WI 53213 is the current repository of records and artifacts.

THEORETICAL AND METHODOLOGICAL OVERVIEW:

As indicated in the scope of work (see Appendix A), this investigation was guided by numerous objectives and goals made explicit by the St. Paul District, U.S. Army Corps of Engineers. Four specific tasks set forth in the scope of work include: (1) development of a research design to include the design of a probability sample; (2) conduct a reconnaissance survey based on the sampling design; (3) develop a predictive model for site location; and (4) preparation of a detailed technical report. In turn, the model is to be applied to determine the needs for further survey, the adequacy of future survey methods and techniques, and the impacts on cultural resources from various St. Paul District, U.S. Army Corps of Engineers sponsored or authorized actions.

These investigations were also authorized so as to represent partial fulfillment of mandated obligations for cultural resources. Applicable legislation or directives include: the National Environmental Policy Act of 1969 (P.L. 91-190); The National Historic Preservation Act of 1966 (P.L. 89-665) as amended; Protection and Enhancement of the Cultural Environment (E.O. 11593); Advisory Council's Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800), Preservation of Historic and Archaeological Data 1974 (P.L. 93-291); and Corps of Engineers Identification and Evaluation of Cultural Resources (E.R. 1105-2-50).

Current Research-Archaeology

While most areas of the Upper Mississippi Valley floodplain are virtually unknown, the floodplain in Navigation

Pool 10 is somewhat better known owing to several important and useful investigations. Benn's work at the FTD Site (13 AM 210) provides the first well documented test excavations on the lowland floodplain of Navigation Pool 10 (Benn and Thompson 1976). Deeply stratified archaeological deposits were encountered and a Late Woodland and two Middle Woodland components were identified at the mouth of the Yellow River. Because of limited time and resources and, more importantly, due to the level of the water table, excavations were not conducted to a depth necessary to reach sterile subsoils.

Of additional significance is Mallam's proposed interpretive model of Effigy Mound culture in northeast Iowa (1976). Mallam's work brought needed focus to the role of the lowland floodplain in relation to settlement and subsistence patterns not only to Late Woodland cultures but to more broadly based economic cycles of hunters and gatherers of the region (1976: 36-38). Mallam's position that the resource base of the Mississippi River floodplain was abundant and predictable to a degree that inhabitants could have developed an exploitation pattern similar to Intensive Harvest Collecting (Struever 1968: 305) is an important interpretive device.

In the summer of 1978, the Department of Anthropology, University of Wisconsin-Madison, under the general direction of Dr. James B. Stoltman, initiated long-term research in the driftless area of southwestern Wisconsin. Survey and testing were focused on the "Prairie du Chien Region", defined as the area surrounding the town of Prairie du Chien, bounded on the north by Du Charme ridge, on the south by the Wisconsin River, on the east by the mouth of the Kickapoo River and on the west by the Iowa state line (Stoltman et al 1982). While the primary goal of that research is the development of subsistence and settlement models in the driftless area of southwestern Wisconsin, substantial effort was devoted to conducting both survey and excavations on the lowland floodplain of Navigation Pool 10. A summary of this research can be found in Stoltman (1979), Stoltman and Theler (1980), Theler and Arzigian (1980), Stoltman et al (1982), and Boszhardt (1982).

The most detailed survey report is contained in Boszhardt (1982). Results include the identification of cultural materials ranging from Late Archaic to recent historic times from a variety of lowland floodplain contexts. Very limited test excavations were conducted at 47 Cr 340, and, for reasons clearly noted by the author, were not continued to sterile subsoil.

Limited test excavations were also conducted at Mill Run (47 Cr 185), Mill Pond (47 Cr 186), and Clamshell Point (47 Cr 187) in 1978 (Stoltman 1979). In 1980, Mill Pond (47

Cr 186) was subjected to more intensive investigations (Theler 1983).

While these data from the lowland floodplain are limited in scope, their well controlled and documented contexts have fostered a series of generalizations or working hypotheses with reference to past cultural adaptations to this unique and particularly abundant habitat. As one would expect, information from pre-Woodland contexts is quite impoverished. Theler (1983) reports an ostensible Archaic component at the Mill Pond Site (47 Cr 186) based exclusively on stratigraphic position of lithic debris beneath the Prairie Phase Early Woodland component at the site. Stoltman _et al_ note the occurrence of an Osceola side-notched projectile point recovered from the Mill Run Site (47 Cr 185), and a significant number of Archaic forms are found in private collections. Mr. Alfred Reed, responsible for reporting the vast majority of archaeological sites on the flood plain, has in his possession a significant number of projectile points from pre-Woodland contexts including the base of a lanceolate form.

Stoltman _et al_ wisely interpret the limited data from pre-Woodland contexts on the floodplain:

> In the Prairie du Chien region, however, we still possess only the barest record of human occupation during this time. Our research so far has recovered a total of 25 projectile points that can be attributed to Archaic stage cultures of this interval (Table 1). Since all of these points can be assigned to T-II Period projectile points, only one was recovered from a floodplain context. This is an Osceola side-notched point recovered near the base of the 1978 test pit at the Mill Run site (47 Cr 185). So far this projectile point constitutes the oldest reliable evidence for human presence on the floodplain in the Prairie du Chien region. Because floodplain land surfaces available for human occupancy during this interval are likely to have been buried by subsequent alluviation, making the discovery of archaeological sites of this time extremely difficult, one must be cautious in accepting at face value the current picture of a post-3000 B.C. development of floodplain adaptations. Another factor contributing to what is probably a significant bias in our data is the fact that private projectile point collections from the floodplain have not yet been subjected to intensive analysis; whereas, the ceramics from these collections have been incorporated into our tabulation as recorded in Table 2. With ceramics thus considered in greater detail (thus far), it

> is to be expected that the current picture, that of minor and late Archaic exploitation of floodplain resources, is heavily a product of sampling error (1982: 375).

More recently, and specific to Early (Prairie Phase) and Middle Woodland lowland floodplain adaptive strategies, Theler has proposed a settlement-subsistence pattern for prehistoric occupants of the Navigation Pool 10 environs (1983). Succinctly summarized, Theler indicated that sites of this period reflect short-term summer extraction camps for procurement and processing of fresh water naiades. For Middle Woodland groups, Theler also posits a pattern of abandonment of the floodplain during fall and winter to exploit white-tailed deer and a few other terrestrial taxa in the dissected uplands removed from the main stem of the Mississippi River (1983).

The brief resume here of recent investigations is twofold. First, these well executed studies serve to provide important insights with regard to the establishment of a cultural-historical framework for the lowland floodplain of the study locale. As Stoltman et al note:

> The most pressing need was to develop a comprehensive archaeological sequence for the region, for lacking this interpretive tool, it was impossible to interpret properly the artifacts and sites already known, much less the new data to be recovered. Because of the emphasis upon either mound excavation or surface survey, the known artifact inventory from the region consisted primarily of the few Hopewellian grave lots that Thomas had described in more than cursory fashion and surface collections from plow-disturbed, multi-component sites (1982: 370).

And, second, the very limited, yet well executed and thoroughly analyzed, cultural remains from approximately a half-dozen excavated contexts provide an important initial step to explicating past human adaptations to the lowland floodplain of the Upper Mississippi Valley (see for example: Benn 1976, Boszhardt 1983, Stoltman et al 1982, Theler 1983).

These investigations, however, present neither a complete sequence of prehistoric and historic occupation and utilization of the lowland floodplain, nor an adequate portrayal of human activities in that ecological context. Significant gaps still exist in the cultural historical framework and the limited extent of excavated contexts, while providing much useful data, have derive almost exclusively from shell-midden sites. The reasons for such limitations have been identified by several investigators. Excava-

tions have not been conducted to a depth sufficient to identify the full range of prehistory primarily because of logistical difficulties. The soil matrix alone presents problems as the fine grained wet silts must be water-screened to secure full recovery of cultural materials (Overstreet 1982, Boszhardt 1982, 22-24). More significantly, cultural remains lie buried to depths well below the water table requiring dewatering of excavation units. In some instances, the water table must be locally depressed more than 2.5m (7.85'). This of course varies with fluctuations in the Pool level. Finally, the depth of Holocene soils, and thus, potential living surfaces, often extends more than (15.7') beneath the present land surface.

Our understanding of past life-ways on the floodplain is also hindered by the limited amount of excavated and analyzed contexts. Theler, for example, presents a cogent and logical argument that Early and Middle Woodland occupants were attracted to the floodplain by the extensive fresh water mussel resources (1983). Further, he notes that apparent modifications were incorporated in Late Woodland shellfish procurement and processing behaviors in the Navigation Pool 10 locality (1983: 278-279). The major limitation of these data presented by Theler is that few non-shell midden sites have been adequately tested on the lowland floodplain.

This brief summary of current and previous research at the lowland floodplain locality Navigation Pool 10 represents the basis for our current understanding of prehistoric and historic human occupation and utilization of a unique habitat. The following encapsulated cultural sequence for the lowland floodplain of Navigation Pool 10 is presented only to provide an assessment to current models and our understanding of the extant data.

Paleo-Indian: Identified almost exclusively by surface finds of fluted projectile points in upland contexts surrounding the Pool 10 locality, Paleo-Indian manifestations are placed in a pre-8,000 B.C. time period. As Stoltman notes:

> Until 1979, no site of the fluted point tradition had been excavated within the upper Mississippi River Valley. Indeed, the recognition of the fluted point tradition within the region at all was based upon isolated surface finds of fluted points in scattered upland settings bordering the Mississippi Valley. Consequently, so far as I am aware, no fluted point has yet been recovered from the Mississippi alluvial valley proper (1983: 202).

A single possible exception may be the projectile point found by Nickerson in the Portage Ravine in 1894 and reported by Bennett (1945: 17-18).

Generally, interpretations of Paleo-Indian lifeways in the Upper Mississippi Valley are little more than fanciful speculations derived from better documented occurrences in the Eastern and Western United States. It has been often implied that Paleo-Indians roamed vast territories in search of gregarious big game animals. Another common, though unsubstantiated theme is low population density, small population aggregates, and great mobility. Recognizing the limitations of the archaeological data base, Stoltman has attempted to address Paleo-Indian adaptive strategies form various forms of indirect evidence (1983: 204). One of these lines of indirect evidence has some bearing on the lowland floodplain:

> First, the environment of the upper Mississippi River Valley during the Paleo-Indian Era, while relatively rich in big game, offered little in the way of plant and aquatic resources for human consumption. The conifer-dominated forests of this period (e.g., Wright 1971) were notably poor in edible plant species, while the glacial runoff-enriched streams of the area, with their high gradients and cold waters, would have had limited fish and shellfish resources (Parmalee 1968).

Currently, we cannot accurately portray Paleo-Indian utilization of the apparently inhospitable post-Pleistocene lowland floodplain of Navigation Pool 10. We have confirmed that pre-8,000 B.C. landscapes exist beneath the current floodplain configuration. However, it is also apparent that the Pleistocene-Holocene contacts identified during the course of these investigations are terrace remnants buried by Holocene sediments. Thus, at the time of post-Pleistocene occupation of these surfaces, they would have been terrace rather than lowland floodplain contexts. Additional search for Holocene-Pleistocene contacts adjacent to main channel settings is a critical need.

Late Paleo-Indian: There is little agreement as to how the archaeological manifestations associate with larger lanceolate projectile points should be classified. Many (e.g. Theler 1983: 17) prefer classification within the Early Archaic stage, others, (e.g. Quimby 1960, Stoltman 1983) have assigned the distinctive projectile point forms such as Agate Basin, Eden, Scottsbluff, Brown's Valley and others to the Plano tradition. I have followed Mason's (1981) terminology for two reasons. First, there is substantial evidence for differences in age of Agate Basin and Eden-Scottsbluff related sites (Mason 1963, Salzer, 1974).

Second, there is a growing body of evidence from central and northern Wisconsin and Ontario that support the association of wood working implements (keel backed or trihedral adzes and lanceolate projectile points. This association lends credence to Quimby's original portrayal of the so-called Aqua-Plano lifeway, however, the most popular interpretation of Late Paleo-Indian exploitative strategies derives from the western big-game hunting model. In the absence of significant excavated contexts of Late Paleo-Indian sites, any reconstructions of subsistence-settlement strategies will remain speculative.

Evidence of Late Paleo-Indian presence on the lowland floodplain in Navigation Pool 10 is extremely limited. The base of a single Agate Basin projectile point was found by Mr. Al Reed of Prairie du Chien at the Hunter Channel IV site (47 Cr 360). The context of this artifact is difficult to interpret. It was found during cut-bank survey at an elevation where sediments are much younger than the likely 8,000-6,000 B.C. date of the artifact. As most all specimens retrieved from fore shores are redeposited it seems inappropriate to speculate about the possible processes of redeposition.

Of note is the fact that coring at that locality indicated every likelihood of 6,000-8,000 land surfaces at a depth of 15 or more feet below the surface. Whether or not this is the locality of an Agate Basin component, deeply buried on the floodplain, can only be resolved by subsurface investigations.

Early Archaic: There is clearly some temporal overlap between Late Paleo-Indian and Early Archaic traditions with most archaeologists accepting a time range of 8,000 to 6,000 B.C. Conceptually, Early Archaic represents a transition in the Upper Mississippi Valley to the post-Pleistocene environment. In this construct, supposed reliance on "big game" is diminished, and mobility of population aggregates is somewhat curtailed. More localized adaptive strategies begin to be reflected in the archaeological record, meager though it is, indicating generalized patterns of plant and animal resource procurement. A variety of stemmed and notched projectile points often serve as the only diagnostic implements of Early Archaic occupation (see Luchterhand 1970).

At this juncture, no implements such as Hardin Barbed, Thebes, and St. Charles projectile points have been recovered from lowland floodplain settings in Navigation Pool 10. However, the presence of Early Archaic populations in the region has been demonstrated by the occurrence of type fossils in upland topographic settings. It is now demonstrated that land surfaces of Early Archaic age can be expected on

the lowland floodplain. Stoltman, for example, in his interpretation of stratigraphy from the Modoc Rockshelter (Fowler 1959) suggests:

> All factors considered, the following are the main conclusions that I feel can be reliably derived from the Modoc Rockshelter data concerning the use of the site by foraging peoples: (1) sometime during the T-I Period, foragers had begun to move down from the uplands, at least seasonally, to take up residence beneath overhanging bluffs at the edge of the alluvial valley; (2) this T-I occupancy provides the earliest tangible evidence in the upper Mississippi Valley region of the exploitation of floodplain resources such as fish, shellfish, and waterfowl, but the extremely low density of cultural material suggests that this exploitation was not yet intensive nor highly specialized; and, (3) milling stones and polished stone axes and bannerstones put in their first appearance at Modoc (and, so far, in our entire region) above the twenty foot level, which should date around, or shortly after 5000 B.C. (i.e., within the Meso-Indian Era) (1983: 211).

This working hypothesis is certainly both feasible and testable. If Stoltman is correct in his interpretation of the Modoc data, we should expect to encounter Early Archaic floodplain extration and processing camps on early Holocene land surfaces now buried by later alluvial deposits.

Middle Archaic: With settlement-subsistence strategies purportedly similar to those of the Early Archaic, albeit intensified, Middle Archaic populations occupied the Pool 10 locality between approximately 6,000 and 3,000 years B.C. Sometime during this stage, large side notched projectile points, often with basal grinding begin to occur in the archaeological record (e.g., Fowler 1959, Wittry 1959). Given the successful diversified economic systems of Middle Archaic populations throughout the Upper Mississippi Valley and surrounding regions, it is difficult to conceptualize a hunting and gathering strategy that would have omitted the abundant floodplain resources. Unfortunately, while side-notched projectile points (Raddatz Side Notched) are known from floodplain contexts, there are no excavated associations reported in the Upper Mississippi Valley. We can assume, I think quite safely, that sites of Middle Archaic age lie buried in silt and sand sediments of Navigation Pool 10.

Late Archaic: Significant data have been compiled with respect to Late Archaic mortuary practices in the Upper Mississippi Valley and surrounding Great Lakes Region

(Freeman 1966, Ritzenthaler 1946). Substantial investments in time and labor are indicated for Late Archaic mortuary sites between 3,000 and perhaps 1,000 B.C. Again, while several implements have been recovered from redeposited surface contexts on the floodplain that suggest Late Archaic origin, excavated data are few and equivocal. Boszhardt (1982) reports evidence of Late Archaic occupation at Cr 185 and Cr 186 along the eastern shore of Marais Lake. Stoltman et al note in their 1982 summary of Archaic sites in the Prairie du Chien region:

> As with the Osceola points, these late Archaic types have been found in all environmental zones (including the floodplain, based on preliminary observations of private collections) within the region. Unfortunately, we have not yet been able to isolate valid assemblages for any Archaic component at any site, so that our understanding of the entire Archaic stage within the Prairie du Chien region is woefully inadequate at the present time (1982: 366).

The only substantial excavated component of possible Late Archaic affiliation on the lowland floodplain is reported by Theler (1983). In the absence of diagnostic materials Theler's conclusions are tentative and logically based on the stratigraphic position of the archaeological deposits:

> The earliest component recognized at Mill Pond was encountered in the lowest portions of 6 excavation units which reached a depth of ca. 1.1 to 1.65 meters below the current ground surface. The recovered cultural material consisted of large quantities of flint knapping debris, without associated pottery or features and little organic material. Unfortunately, no diagnostic artifacts were recovered, but the absence of ceramics and the stratigraphic position of this component is suggestive of an Archaic affiliation. The sampled portions of this component were largely confined to a light, sandy soil which quickly graded into pure sand at the lowest levels. The cultural debris from this component may have been deposited directly on a sand beach. Cultural material was not found below 1.64 meters in the two excavation units to reach this depth.

Clearly, the hard data germane to interpretations of Late Archaic life-ways, particularly with respect to the lowland floodplain, are indeed limited for the Navigation Pool 10 locality.

Stoltman, cognizant of these limitations, has offered a

currently tenable hypothesis which serves to characterize Late Archaic adaptations to the Pool 10 lowland floodplain:

> Our recent research in the low floodplain of the Prairie du Chien area has recovered a few Osceola points, the oldest artifacts presently known to us in this habitat, but no evidence yet of an intensive exploitation of the floodplain at this time. It appears that the Old Copper people were primarily upland adapted hunters and fishers who are nontheless likely candidates for initiators of the process of more intensive utilization of floodplain resources in the more northerly segments of the Upper Mississippi Valley region (1983: 215).

There is virtually no doubt that Late Archaic land surfaces are common within the limits of Pool 10. It remains, however, for these surfaces to be identified and subjected to adequate scrutiny to accept or reject Stoltman's model of lowland floodplain utilization by regional Late Archaic populations.

Late Prehistoric Archaeology of the Pool 10 Floodplain:

Important research has recently been conducted in the immediate project environs by the University of Wisconsin-Madison. Under the general direction of Dr. James B. Stoltman, a multi-staged program of survey and testing has provided substantial new data with reference to Woodland era subsistence and settlement patterns on the lowland floodplain (see Stoltman et al 1982, Boszhardt 1983, Theler 1983, Stoltman, n.d.). From these sources, with emphases placed on Theler (1983) and Boszhardt (1982) significant changes in several aspects of seasonal floodplain resource procurement and processing have been established for the late prehistoric eras in Navigation Pool 10.

Early Woodland: The initial Woodland manifestation in the Pool 10 locality is identified by several designations including Ryan Phase, Ryan Complex, Ryan Focus, and Marion Culture. Dating from perhaps 300 B.C. to A.D. 100, the "Ryan Phase" is identified by the presence of thick walled, grit tempered, coiled ceramic vessels (Lindner 1974) with surface motifs that include fingernail impressions, interior/exterior cordmarking, and bosses (Boszhardt 1982). Associated projectile point forms include the types Kramer Stemmed (Munson 1966, 1971, Lindner 1974). The relationship of Marion Culture ("Ryan Phase") site and the Red Ocher mortuary complex seems significant but is imprecisely known (for a more critical assessment of Marion Culture/Red Ocher mortuary contexts see Stoltman 1983: 220-221). The presence

of "Ryan Phase" components on the lowland floodplain is clearly demonstrated by redeposited cultural materials at cut-bank localities. However, no excavated contexts or significant subsistence information have as yet been reported.

Subsequent to the sites of Marion Culture affiliation is the recently defined Prairie Phase (Stoltman n.d.). The most detailed portrayal of this phase derives from excavated components at 47 Cr 186 and 47 Cr 348 (Theler, 1983). In his summary of the Prairie Phase data from these sites Theler states:

> This stage is presently recognized by two excavated components (at 47 Cr 186 and Cr 348) and surface finds of the Black Sand-related Prairie Phase in the Prairie du Chien area. The component of Mill Pond (47 Cr 186) represents a summer occupation where aquatic resources, particularly shellfish and fish, were harvested in some quantities. In this phase we have the earliest demonstrable evidence for intensive exploitation of shellfish in the upper Mississippi Valley. Larger terrestrial mammals, including white-tailed deer, are also important (1983: 275).

The Prairie Phase, based on current data, has a rather short duration in the archaeological record at Navigation Pool 10, persisting for perhaps only two centuries (100 B.C. - A.D. 100). Theler notes:

> The Prairie Phase may only have a brief temporal presence in southwestern Wisconsin. While several riverine sites have been identified by the presence of pottery exposed through extensive lateral erosion of optimal occupational areas along relic levee systems, the actual human population during this phase may have been small. The evidence pointing to winter occupations has been elusive (1983: 276).

Middle Woodland: Two Middle Woodland phases have been defined for the immediate project environs by Benn (1979) and Stoltman (1979). Critical assessment of the Benn and Stoltman frameworks reveals few significant differences. Thus, the distinctions between the Havana-related McGregor Phase (Benn 1979) and the Trempealeau Phase (Stoltman 1979) reflect little more than state boundaries. The same situation applies to the subsequent post-Havana developments identified by Benn (1979) as the Allamakee Phase and by Stoltman as the Millville Phase (1979).

The present knowledge of Trempealeau (McGregor) Phase

occupation and utilization of the floodplain is quite scant and is succinctly summarized by Theler:

> Survey activity in the Mississippi River floodplain has identified a small number of sites with Trempealeau phase ceramics. None of these has been excavated, and we currently have no subsistence information for this phase. Although more than 20 shell middens are known in the Prairie du Chien region, none appears to contain Havana ceramics (1983: 277).

He further infers:

> This phase may be of short duration in this portion of the Mississippi Valley. It <u>may</u> be 'grafted on' to an existing Woodland base and does not seem in any sense to be an <u>in-situ</u> development. The flood plain-terrace position of habitation sites is perhaps suggestive of a strong riverine subsistence orientation. This phase, like the preceding one, may be characterized by small human populations. If this is the case, seasonal movement by family groups into the dissected uplands may not have been necessary to obtain a sufficient annual supply of deer meat and hides (1983: 277).

This view is supported by the results of John T. Penman's extensive survey and testing investigations of the Great River Road in Wisconsin that identified few significant Middle Woodland manifestations in upland contexts (J. Penman, personal communication).

Present models of regional Havana-related Middle Woodland indicate both upland and floodplain utilization, greater population size and density than the preceding Prairie Phase, and mortuary sites in both upland and floodplain settings (Stoltman 1983: 224-225). While seasonal patterns have not yet been established for the Pool 10 locality, it appears likely that floodplain utilization during the Trempealeau/McGregor Phase may have been more enduring than in Early Woodland times as well as in subsequent occupational sequences.

Shortly after A.D. 200-300, the influence of Havana/Hopewell relationships seems to have waned. This is reflected largely in ceramic styles and other elements of material culture. Throughout the Upper Mississippi Valley, late Middle Woodland cultures begin to exhibit a more localized series of characteristics. In the Pool 10 locality, two phases, Millville (Stoltman 1979) and Allamakee (Benn 1979) have been identified. Both designations draw heavily from the best documented settlement of this era, the Millville Site (Freeman 1969).

Theler cites evidence for upland winter settlements and floodplain occupations during summer months (1983: 278):

> The basis of winter subsistence was large mammals, particularly the white-tailed deer, while summer occupation seemed to rely on mussels and fish harvest. Carbon isotope analysis (Bender et al, 1981) indicates maize was not yet an important element in the diet. This is to some degree supported by a lack of carbonized maize in the extensive floral assemblages recovered in features at the Mill Coulee Shell Heap (C. Arzigian, personal communication) (Theler 1983: 278).

Mortuary sites are described as less complex, i.e., fewer and perhaps smaller mounds are constructed, and grave furniture and goods less elaborate. For critiques of Millville/ Allamakee mortuary practices see Stoltman (1979, 1983) and Benn (1979).

Late Woodland: Late Woodland habitation, extraction and processing camps, and mound groups are, as one would expect, abundant in the region. Much remains to be learned regarding the diverse Late Woodland archaeology of the region, however, Theler's broad conceptualization will serve well as a general assessment of current knowledge:

> I broadly define Late Woodland here to include cultural entities producing cord impressed ceramic types and wares as Lane Farm Cord Impressed, Madison Cord Impressed, and Minott's Cord Impressed. In the earlier part of this stage we find what may be the first evidence of a non-residential mussel processing station at the Mill Pond Site (47Cr186) associated with Lane Farm ceramics. The Lane Farm and Madison ceramics are well represented within winter and summer components in the Driftless Area. Again, the major deer harvest took place during the fall and winter, with groups moving onto the flood plain for exploitation of mussels and fish during the summer months. It is at about A.D. 800 that we find extensive mussel processing stations at non-residential area (e.g. 47Cr310). also at this time, carbonized maize kernels appear in the Late Woodland feature contexts, suggesting some dietary reliance on tropical cultigens (C. Arzigian, personal communication; also see Benn 1980: 140-141). The movement to upland fall-winter hunting and processing camps may have been delayed somewhat, if maize cultivation have become an important activity (Ibid: 193-194). A delay in the deer harvest may allow or necessitate the intensive harvest, processing and drying of shell-

fish to serve as a contingency resource at winter occupations. This resource would be impossible to detect from the subsistence evidence represented at winter sites alone. An increase in the region's population during the Late Woodland may be a factor initiating an intensification in shellfish procurement. A parallel situation in local resource exploitation has been suggested in the lower Illinois River valley during the Early Late Woodland stage (Styles 1981: 268) Theler 1983: 278-279).

Based on current research in the Pool 10 locality, several themes are identified. These include, a larger population base, a wider range of functionally specific sites (e.g., shellfish extraction and processing sites of a nonresidential nature, garden localities), introduction of maize horticulture, and bluff-top mound construction. A major limitation is noted by Stoltman: "One of the greatest handicaps to understanding Effigy Mound Culture, however, is that so few habitation sites have been excavated" (1983: 228).

Mississippian: Upper (Oneota) and Middle Mississippian artifacts occur on the floodplain of Navigation Pool 10 and the adjacent uplands and terraces (Boszhardt 1982, Theler 1983, Overstreet, Fay, and Mason 1983). Most of the cultural materials clearly of Upper or Middle Mississippian derivation occur as isolated surface finds in redeposited context, as very minor elements in excavated assemblages, or as poorly documented museum collections. Given these limitations, it is meaningless to speculate about the nature and extent of the Mississippian presence along this reach of the Mississippi River. However, archaeologists have long been aware of the dramatic presence of Mississippian sites along the bluffs and terraces of Jo Daveiss County. In addition, recent investigations in the La Crosse, Wisconsin area at numerous sites, under the general direction of James Gallagher, UW-La Crosse, Mississippi Valley Archaeology Center, Inc. have provided much new data regarding Oneota occupation of the river terraces.

Historic Period Archaeology: Minor research has been conducted at historic aboriginal and Euro-American sites on the Navigation Pool 10 floodplain. Recent baseline studies (Oerichbauer 1976, Overstreet, Fay, & Mason 1983) serve to underscore the potential significance and variety of historic period sites. Our understanding of historic Indian utilization of the floodplain is more strongly based in ethnohistory and ethnographic accounts than in the archaeological record. Late historic archaeology couched in such themes as fisheries, clamming, logging, and trans-

portation is a rich but unexplored (through archaeological methods and techniques) research universe.

Data Biases:

As this brief summary of current archaeological research notes, there is substantial information that aids in the reconstruction of occupation and utilization of the Pool 10 floodplain during the late prehistoric eras. The Paleo-Indian and Archaic stage models, however, are little more than inferential. Archaeologists have not identified or focused upon land surfaces of sufficient age to secure adequate data for life-ways reconstructions. The various reasons for this have already been cited including incomplete knowledge of the sediment geomorphology of the floodplain, extremely difficult logistical problems, and perhaps some preconceived notions that were in error. Until these limitations and biases are corrected so-called indirect or tangential evidence will likely be relied upon for interpretation of pre-Woodland phenomena.

The very late stages of the archaeological record have simply not been investigated. This should be a much easier problem to resolve as historic period sites are certainly more accessible, buried, in many localities, by only 10 to 20cm of recent silty and sandy alluvial deposits.

Finally, an additional important bias of course is the focus on the lowland floodplain and the omission of adjacent terraces and uplands. There is no attempt here to state any comprehensive cultural models for the region. Rather, efforts are placed on interpretations of cultural behavior from one element of a larger ecosystem. Admittedly, the boundary of the study area is an artificial one defined for management purposes and limits what can be hypothesized about the alluvial valley in its entirety.

Current Research-Geomorphology:

Until quite recently, only limited and cursory investigations had been conducted with regard to the alluvial stratigraphy of the Upper Mississippi Valley floodplain. Perhaps the most useful recent study to aid our understanding of the development of the post-Pleistocene floodplain in the Pool 10 locality is the Driftless Area summary of Holocene fluvial stratigraphy and climatic change (Knox, McDowell, and Johnson 1981). Based on extensive fieldwork, the authors note the relationships between major climatic shifts and events of deposition and erosion:

> During the last 10,000 years, in the Driftless Area, average characteristics of temperature and moisture have changed from cool/moist (10,000-

> 7,500 BP), to warm/dry (7,500-6,000 BP), and back to cool/moist (6,000-0 BP). During the period of maximum warmth and dryness, average annual stream runoff probably was 40-60 percent less than the average runoff of the present. The three climatic episodes produced three major depositional units which also reflect long-term changes in the sediment sources and flooding characteristics. Floods associated with the snowmelt and/or relatively low in intensity frontal precipitation appear to have been a major cause of erosion and sedimentation of alluvium prior to 7500 BP. Be tween 7500 and 6000 BP, convectional thunderstorms probably were a dominant cause of erosion and sedimentation of alluvium. Several minor fluvial episodes representing differences in intensity of erosion and deposition of alluvial sediments also are apparent for the period since 6000 BP. In contrast, the periods from 4400 to 3100 BP, 1800-1200 BP, and from 800 BP to the time of agricultural settlement were characterized by relatively stable conditions. Because the gradual changes in vegetation, implied in pollen diagrams, correspond poorly to the relatively abrupt changes apparent in the fluvial stratigraphy, we suggest that variations in meteorological conditions associated with the recurrence intervals of relatively large floods provide the best explanation for the episodic character of Holocene fluvial activity in the Driftless Area (Knox, McDowell, and Johnson 1981: 107).

Of course, how these three major climatic episodes and the three major depositional units are reflected in the Pool 10 floodplain stratigraphy, has yet to be determined. At the same time, the potentials for correlating the Holocene archaeological record with the major climatic episodes/ depositional units on the lowland floodplain are exciting. As a first step in this challenging problem, the U.S. Army Engineer Waterways experiment Station has recently conducted a geomorphic study of Navigation Pool 10 (Church 1984). The objectives of this study reflect an overall goal of identifying the potential locations of archaeological sites and providing a description of the environmental setting of those archaeological sites. Specifically, the geomorphic investigation addressed three objectives: (a) description of the geomorphic development of the Pool 10 locality; (b) determination of the relationship between the location of known archaeological sites and geomorphic development of the floodplain; and (c) a determination of the potential of locating archaeological sites on specific landforms within Navigation Pool 10 (Church, 1984: 3).

The investigations conducted by Church (1984) had several limitations that hindered their work:

> Certain limitations are inherent in these data sources and they need to be identified at the outset. It must be emphasized that interpretation of the landforms in the Pool No. 10 area was done from aerial photographs and not field inspection and survey. While a wealth of information can be gleaned from aerial photographs it is always advisable to corroborate photographic interpretation with actual ground inspection. Chronological control of the development of the Mississippi floodplain is based on only a few archaeological site affiliations and extrapolation to other areas involves some uncertainty. The existing archaeological dates span only about one-third of Holocene time leaving the early development of the floodplain unclear. The borehole data available for the Pool No. 10 area are insufficient in quantity and detail to permit more than a generalized knowledge of the stratigraphy of the alluvial fill in the Mississippi Valley. Late-Glacial and early Post-Glacial development of the valley fill and terraces is, to a large degree, based on the presumed impact of glacial events upstream, and not on detailed sedimentologic and stratigraphic studies. Until field evidence is examined, the conclusions drawn in this report regarding the chronology of formation of the Mississippi floodplain and other geomorphic features of the Pool No. 10 area must remain tentative (Church 1984: 5).

In spite of the significant limitations, the 1983 geomorphic study provided a relatively precise understanding of the geomorphic contexts currently visible on the floodplain. Further, subsequent field investigations confirmed a high degree of accuracy of floodplain landforms identified by aerial photographic interpretation. These investigations included reconnaissance of identified landforms utilizing walk-over surveys and limited soil coring conducted by Mr. Church of the Experimental Waterways Station and personnel from the Great Lakes Archaeological Research Center, Inc. The primary intent of these field investigations was to ground truth geomorphic features identified from air photos and topographic maps of various eras ranging from the late 19th century to contemporary maps. More comprehensive discussion of these investigations is presented in the results of the Stage I sample. As is often the case, additional data secured during the field investigations of geomorphic features raised a number of new questions. For

example, the discovery of deeply buried archaeological components suggests that accretion of the floodplain during the Holocene was perhaps more dramatic than previously suspected. Establishing the relative and absolute chronologies of Holocene surfaces on (in) the floodplain, while technically difficult, is now feasible. Finally, knowledge of the age and extent of buried surfaces would represent an important tool in interpreting the Holocene cultural sequence at Pool 10 as well as other localities in the Upper Mississippi Valley.

Analyses of data collected during the geomorphological field investigations including sedimentologic and stratigraphic descriptions, analyses of cores, and more refined assessments of the presence of early Holocene surfaces, the distribution and depth of post-Pleistocene alluvium, and the characteristics of post-European alluvium has been completed by Church (1984). From the results of that study, it is clear that fully integrated archaeological-geomorphic studies have provided partial answers to the objectives outlined. Finally, the resolution of remaining problems can be approached with much greater assurance than would have been possible without the geomorphic investigations.

Remote Sensing Applications-Theoretical Bases:

The unique aspects of the lowland floodplain of Navigation Pool 10 require the implementation of non-traditional archaeological survey techniques, a factor clearly identified in the scope of work governing these investigations:

> The alluvial nature of the floodplain environment will require survey methods not typical to upland archaeological investigations. While normal shovel testing may be warranted for certain areas, cut bank profiles, coring, boring, backhoe trenching and other forms of deep testing may be necessary for many areas. The nature of this survey will require the Contractor to be extremely flexible in the methods selected and will present a challenge to developing innovative approaches to data extraction (see Appendix A: 4).

While we were aware of applications with hand-tools, earth-moving machinery, shovel probing, and other methods of shallow sub-surface investigations, none seemed adequate to investigate the potentially deeply buried Holocene landsurfaces. As a result, consideration was given to various remote sensing techniques which have been recently applied to archaeological problems. Applications of satellite and aerial based remote sensing techniques have been well established in archaeology. Such techniques as black and white aerial photography as well as convention color and

color infra-red, Landsat imagery, and photogrammetry are well known (Lyons 1976). Ground based techniques such as electrical resistivity, ground penetrating radar, cross-hole sonar, seismic refraction, have been applied to lesser degree in archaeological research (e.g., Parrington 1975, Bevan and Kenyon 1975, Vickers and Dolphin 1975, Lyons 1977), usually on site-specific bases and often with non-conclusive results.

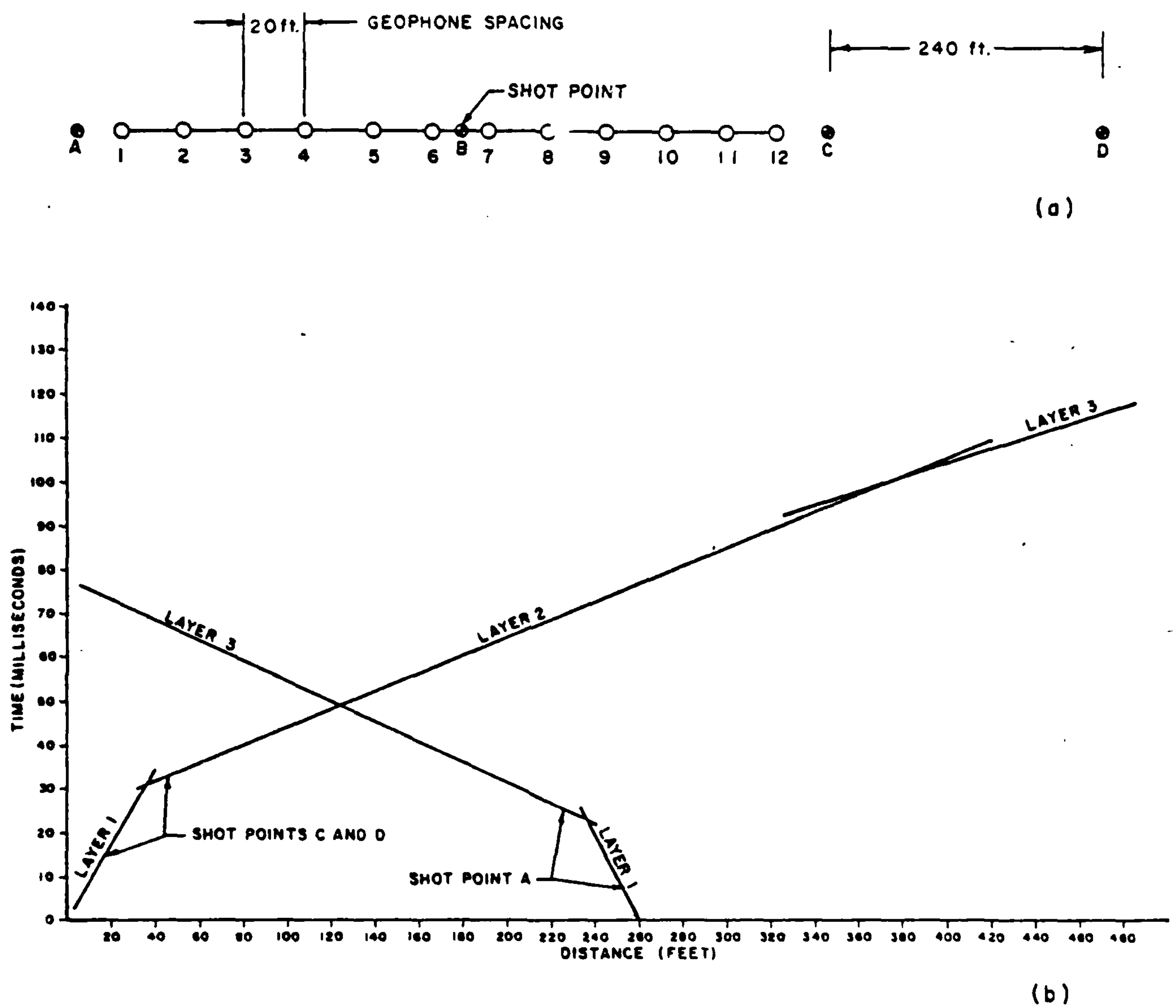
Two ground based remote sensing techniques, seismic refraction and ground penetrating radar, were selected in an attempt to ascertain specific information relating to Holocene fluvial stratigraphy and archaeological deposits. Other remote sensing techniques were evaluated in terms of their potential applicability to the floodplain environment.

Seismic refraction:

Refraction seismology involves electronically measuring, at known points along the ground surface, the travel times of elastic seismic waves generated by an impulse energy source. The data consist of records of wave travel times from the energy source to each of 12 receivers (geophones). When arrival times are plotted against the distance of the geophones from the energy source, the velocities and thicknesses of subsurface layers can be calculated (Figure 2). In this application, each seismic line consisted of 12 geophones spaced 20 feet apart, for a total length of 220 feet. An impact hammer was used as the energy source, with shot points at each end of the line, and a third shot point either in the center of the spread, or 260 feet off one end of the line (see Figure 2). The shot at the center of each spread was used to provide information about the depth of Holocene silts and possible variation in its velocity. A shot point located 260 feet off the end of the line was used in anticipation of detecting arrivals from the bedrock surface. This configuration results in a total distance of 480 feet from the shot point to the furthest geophone, which is usually sufficient to detect arrivals from bedrock surfaces at an approximate depth of 120 feet.

Ground Penetrating Radar:

Instrumentation used for this application was a SIR System 8 manufactured by Geophysical Survey Systems, Inc. The system consists of a control unit, transducer (radar transmitter, receiver, and antenna), a graphic chart recorder, and a magnetic tape recorder. The equipment was operated on 12 volts DC which was supplied by a 12 volt battery continuously recharged through the use of a portable gasoline generator.



(a) SHOOTING ARRAY SHOWING RELATIVE POSITIONS OF SHOTPOINTS AND GEOPHONES.

(b) TIME-DISTANCE CURVE OF McGREGOR LAKE SEISMIC DATA AS COLLECTED USING DEPICTED SHOOTING ARRAY (a). A 3-LAYERED EARTH IS SHOWN.

Donohue

1984
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Engineers & Architects

REMOTE SENSING INVESTIGATIONS
OF UPPER MISSISSIPPI RIVER, POOL 10,
NEAR PRAIRIE DU CHIEN, WISCONSIN

FIGURE 2

Radar transducers operating at different frequencies and wave lengths can be used with this equipment. In general, lower transducer frequencies will yield greater depth of penetration of the radar signal, while higher frequencies, although not able to penetrate the earth as deeply, give the greatest resolution. This greater resolution gives the higher frequency transducer the ability to discriminate between closely spaced objects and interfaces. The antenna used for this study operates at a center frequency of 500 megahertz. This transducer provides adequate depth penetration while maintaining good near surface resolution.

In operation, a brief pulse of electromagnetic energy is directed into the ground. When this energy encounters an interface between two materials of differing dielectric properties, a portion of the energy is reflected back to the transducer. The reflected energy is received by the transducer and processed within the control unit where it is amplified and the time differential between initial transmission of the electromagnetic pulse and the reception of the reflected wave is determined. The electromagnetic wave travels through the medium at a velocity dependent upon its dielectric characteristics, so the time differential can be converted into depth. This requires knowledge of the dielectric constant of the medium, or more commonly, on site determination of the depth of a visible radar target. The electromagnetic pulse is repeated at a rate of 50 kilohertz and the resultant stream of radar data is sent to the chart recorder where a continuous hard copy profile of the data is produced as the transducer is moved along the surface.

At the control unit, the operator has an oscilloscope display upon which the reflected wave form can be continuously monitored. Controls are also available which are used to adjust and optimize the wave form to produce the best output on the graphic chart recorder. In addition, wave forms are recorded on a magnetic tape recorder and can be later reproduced in the lab. This allows for data reduction and computer generated enhancement of the radar profiles in the laboratory.

These remote sensing techniques were selected for their particular characteristics to secure data to assist in the solution of three problems. The first of these was to delineate the depth of contacts between Holocene and Pleistocene sediments. Both seismic refraction and ground penetrating radar were applicable to this problem. The second major objective, to determine the depth to bedrock, located more than 100 feet below the surface relied upon seismic refraction as that depth is beyond the capabilities of the ground penetrating radar unit employed in these investigations. The third major objective was to detect

possible archaeological deposits within the Holocene sediments. Generally, this level of discrimination is not possible with seismic refraction techniques and reliance was exclusively on ground penetrating radar.

Archaeological Reconnaissance methods and techniques:

A major element of the archaeological reconnaissance of Navigation Pool 10 was the design of a sampling strategy that would incorporate the results of the geomorphic survey conducted by Church and Smith (1983). The focus was to be placed on geomorphic environments to be employed as sampling strata. In order to fulfill this goal, it was necessary to conduct the sampling survey in a staged manner. The first stage was directed to confirmation in the field of the geomorphic environments identified by Church (1984) through aerial photographic interpretation. The second stage was to be directed to more critical assessment of archaeological deposits at specific geomorphic environments. The two stage sampling strategy was to be applied to several questions identified in the scope of work.

These questions include: (1) is there a correlation between abandoned channels and sites of a specific period? (2) do certain geomorphic environments show higher probability of sites? (3) do certain geomorphic environments contain sites which have been deeply buried? (4) what techniques are necessary to locate deeply buried sites in a floodplain environment? (5) is there a correlation between different geomorphic environments and certain types of sites? and (6) do the probabilities of site locations within a specific geomorphic environment change as a result of its proximity to other controlling factors such as terraces and tributary streams?

Stage I Sample:

The Stage I reconnaissance sample was designed with three primary purposes in mind: (1) to conduct field verification of landforms identified during the geomorphic study; (2) to ascertain, in so far as possible, the depth of historic sediments (those deposited since the mid-19th century) at various sedimentary environments; and (3) to identify both reported and unreported archaeological sites on (in) varying alluvial landforms.

Our baseline data for this Stage I sample consisted of a series of maps at a scale of 1:24,000, derived from pre-lock and dam (1927) and post-lock and dam (1961) aerial photographs and various topographic maps, on which geomorphic features were interpreted and delineated (Church 1984). In addition, transparencies depicting the locations of known archaeological sites were provided by the St. Paul District Corps of Engineers so that particular geomorphic features

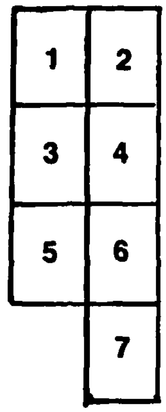
could be correlated with archaeological sites. Plates 1-7 (Appendix B) depict the distribution of geomorphic features identified for Navigation Pool 10, Figure 3 provides an index for plates 1-7, and Table 1 presents the array of geomorphic features identified by Church (1984).

The general intent of this Stage I sample was not only directed to preliminary attempts to determine how prehistoric and historic sites were distributed over the landscape of Navigation Pool 10. Of greater concern was the need to determine how the landscapes themselves were distributed on (in) the floodplain. As table 1 indicates, Church (1984) had already identified superimposed geomorphic features from surficial (remote) investigation and we were able to infer from these data that an exceedingly complex two dimensional sampling universe was in fact an even more complex three dimensional sampling universe.

Table 1

Geomorphic Features, Navigation Pool 10
(after Church 1984)

Valley Wall	Colluvial Slope
Tributary Terrace	Tributary Floodplain
Tributary Channel	Alluvial Fan
Mississippi Terrace	Major Channel
Minor Channel	Abandoned Channel
Overflow Channel	Lateral Accretion Deposit
Lateral Accretion Ridge	Vertical Accretion Deposit
Braided Stream Deposit	Lake (pond)
Mid-Channel Island	Vertical Accretion Deposit over Lateral Accretion Deposit
Vertical Accretion Deposit over Abandoned Channel	Vertical Accretion Deposit over Alluvial Fan
Vertical Accretion Deposit over Tributary Floodplain	



Map References:

1. Prairie du Chien, Northwest, U.S.G.S. 7.5' quad.
2. Prairie du Chien, Northeast, U.S.G.S. 7.5' quad.
3. Prairie du Chien, Southwest, U.S.G.S. 7.5' quad.
4. Prairie du Chien, Southeast, U.S.G.S. 7.5' quad.
5. Clayton, U.S.G.S. 7.5' quad.
6. Bagley, U.S.G.S. 7.5' quad.
7. Guttenberg, U.S.G.S. 7.5' quad.

Figure 3: Index to Plates 1-7 (Appendix B)

Stage II Sample:

Based upon information derived from the Stage I sample utilizing techniques of soil coring, auger sampling, surface collection, informant interviews, review of museum collections, and on-site landform verification with Mr. Peter Church, the Stage II sample was designed to provide specific information sets. The discovery of deeply buried archaeological components during the Stage I sample provided useful new information. At the same time, Stage I sample results demonstrated that it was not feasible to attempt a stratified random sample as suggested in the Scope of Work (see Appendix A). Church's geomorphic mapping of the Navigation Pool 10 floodplain is with minor exceptions a two-dimensional reconstruction. In a few localities vertical and lateral accretion deposits were noted as superimposed. However, it is apparent that the depth and age of buried Holocene surfaces is an unknown. With such severe limitations of knowledge of the universe to be sampled, i.e., an unknown distribution of buried surfaces, a stratified random sample of the known two-dimensional universe would serve only to compound the previous bias of investigating only surficial features of the floodplain.

In light of these limitations, our field strategy for the Stage II sample was modified to include transect samples along island margins that would cross-cut geomorphic features delineated by Church (1984). In addition, the focus was placed on sampling vertically rather than horizontally. This forced us to consider and investigate buried occupation surfaces in the floodplain matrix. Our efforts were rewarded with heretofore previously unknown data relating to age and depth of buried Holocene surfaces that were occupied by prehistoric residents. These factors notwithstanding, a stratified random sample will not be attained until such time as the distribution of these surfaces is made explicit. In conclusion, it must be noted that our actual sample size is so limited as to be statistically insignificant and all predictive statements must be tempered with this reality of sample size limitations.

Essentially, the Stage I sample was designed to yield sufficient information to assess what we could realistically predict. The Stage II sample was designed to secure reliable data that would allow specific statements regarding cultural-environmental correlations. Gross generalizations have little utility either for research or management purposes. Thus, we sought detailed geomorphic/archaeological information regarding the depth of site burial, ostensible functional identification of both deeply and moderately buried sites, and, if possible, establishment of cultural affiliation of buried components.

Extensive information detailing late prehistoric cultural sequences and adaptive strategies had already been provided by Stoltman (1979), Stoltman et al (1982), Boszhardt (1982), Benn (1976), and Theler (1983). We sought to avoid redundancies in the Stage II sample and emphasize the identification of early Holocene surfaces and archaeological components associated with such surfaces. During the Stage II sample, remote sensing (ground penetrating radar and seismic refraction) and test excavations were added to reconnaissance methods and techniques employed during the Stage I reconnaissance sample. As many of the methods and techniques are not commonly applied, the following narrative provides a brief description of the reconnaissance techniques.

Hand Tools:

Two types of hand tools were used for collection of geomorphic and archaeological data: an Oakfield Soil Sampler and a modified "Iwan" pattern earth auger. The Oakfield soil sampler was simply pushed into the alluvium until the 1 inch sample tube is filled (1 foot increments). Soil samples were collected in plastic sample bags and numbered consecutively from the surface to the point where the probe was abandoned, normally at a depth of not more than 14-16 feet below the surface. A series of 3 foot extensions were added as the depth of the probe increases. When samples were not collected, the tube contents were merely sliced to provide a clean, uncontaminated surface for inspection. This is often necessary as the wet, fine grained alluvium has a tendency to cling to the exterior surface of the sample as the tool is pulled up through the sample hole. When coarse grained sediments are encountered it is not unusual for bit refusal to occur, or, for the sample to wash out of the tube during retrieval, particularly when attempting to sample at a depth of 5 or more feet below the water table.

In a few rare instances cultural materials, e.g., waste flakes, charcoal, burned rough rock, or shell, were found within the soil sample. These were simply lucky incidents considering the matrix being sampled consists of a one-inch diameter plug. Depending on localized soil conditions, it takes approximately 1-2 man-hours to collect, inspect, and record samples for each core at a depth of 15 feet.

Mr. Neil Ostberg of Slinger, Wisconsin manufactured the modified "Iswan" pattern earth augers used during the reconnaissance. Using three inch water pipe, the augers were constructed with a one-inch retrieval port along the long axis of the 6 inch sample tube. Holes were placed at the top of the sample tube to allow water to flow through the tube as the auger was lowered into the sample hole.

Auger teeth were welded to the bottom of the tube so that the tool would "bite" into the alluvium and the matrix would then be "wormed" up into the tube. Three-quarter inch galvanized pipe, three feet in length and scored at one foot increments was used for extensions. This of course required pipe wrenches for putting together and dismantling the tools. Attempting to retrieve 15 feet of three-quarter inch pipe from wet alluvium is an interesting experience. A well-puller or long crow bar is recommended for deep sampling in wet alluvium.

The advantages of the auger are two-fold. First, the sample size is trebled and thus the likelihood of recovering cultural materials is enhanced. The second major advantage is that bit refusal is seldom a problem and we were able to core through areas that contained gravel, burned rough rock, and coarse sediments that would have refused the Oakfield tools.

Sampling with the three inch diameter auger is a very slow process. In one instance, at the FTD Site (13 AM 210) a 17 foot deep sample required almost two full man-days to collect and record. Minor tool modifications, particularly expansion of the sample retrieval port, will serve to make this a more efficient sampling technique.

Giddings Auger, portable derricks, mobile drill rigs:

The advantages of various "portable" mechanized coring and boring rigs are many. For example, with the use of Shelby tubes, samples remain intact and are easily transported to the lab for analyses. Depth of penetration through the use of hydraulic systems or other means is well beyond hand tool limits. However, for our purposes on the floodplain of Navigation Pool 10, we found that portability was not adequate.

Mr. Church attempted to extract cores at several locations on the lowland floodplain and in most instances could not secure access with a Giddings Auger. The auger, pulled behind a 1/2 ton truck could not be maneuvered into lowland contexts in most situations. At such localities as the Bagley bottom and Ambro Slough, cores were extracted only because access roads had been constructed at these localities. Both locations represent buried terrace margins and provided useful information. Main channel environments could not be sampled. In order to do so, the equipment would have to be transported by barge or other means. Perhaps deep sampling could be accomplished during the winter months when access could be achieved by transporting various "portable" rigs across the ice.

Cut-bank survey:

Cut-bank survey, as the name implies, consists of inspecting the land-water interface where erosion has removed the earth matrix and redeposited cultural materials on the foreshore. The great majority of archaeological sites known for Navigation Pool 10 have been discovered using this technique which has major advantages but also possesses significant limitations.

Surface collection at erosional exposures is undoubtedly the most cost-effective means of locating archaeological sites in Pool 10. The samples from many of these sites are quite large, include substantial numbers of diagnostic artifacts, and represent the most efficient means of establishing the regional culture-history. Our current knowledge of floodplain archaeology, and thus our conceptualizations of Pool 10 prehistory, derive almost exclusively from these cut-bank surveys. In summary, this technique depicts an important first step in the cultural resources management process but some limitations need to be examined.

The first obvious limitation is survey bias. As this technique has been the most rewarding in terms of information yield it has been emphasized. Archaeologists have focused on erosional features and have excluded depositional environments. In addition, erosional environments occur only along active channel systems. Owing to these factors, we have virtually no data with regard to archaeological site distributions in stable or depositional geomorphic contexts.

A second limitation of cut-bank surveys stems from the age of land surfaces subjected to erosion. With one notable exception (a late Paleo-Indian projectile point from Hunter Channel) no diagnostic artifacts earlier than Late Archaic times have been recovered from cut-bank surveys in Navigation Pool 10. The inescapable inference is that land surfaces older than approximately 3500 BP are not being subjected to erosion.

Third in this series of limitations is the nature of assemblages recovered from cut-bank surveys. With the exception of diagnostic artifacts, cultural materials from cut-bank surveys do little except provide the locations of archaeological sites that are being destroyed. Because the materials are redeposited in a disturbed context on foreshores, lithic, faunal, ceramic, and other assemblages have meager heuristic value. Unless recovered in situ, the interpretive value of non-diagnostic cultural remains is minimal.

Finally, cut-bank surveys draw appropriate and dramatic attention to the destruction of the archaeological data base (see for example Gramann 1982). Navigation-related impacts on archaeological sites in Navigation Pool 10, as in other pools along the Mississippi River, are severe. More than 90% of the identified archaeological sites on the floodplain are being devastated by processes linked directly to maintenance of the 9 foot navigation channel. Two major effects are the high-water levels that fluctuate throughout the year, in turn killing protective shoreline vegetation and thus speeding erosion, and, the wakes created by barge traffic (Theler 1983: 135-136). It will not be possible to realistically measure the relative destruction of the archaeological data base until such time as more refined data are available for buried sites and in non-erosional contexts. Currently, it appears as though the navigation-related impacts are obliterating all the known sites in the pool.

Informant Interviews:

Informant interviews are always an important information source. Seeking out local historians, collectors, and others with practical knowledge of a given project area avoids much duplication of effort, and in some cases, unnecessary embarrassment. We were truly fortunate to acquire the assistance of Mr. Al Reed of Prairie du Chien whose knowledge of the natural environment as well as the archaeology of Pool 10 is imposing. Mr. Reed spends a great deal of his leisure time on the river and has strong emotional ties to the floodplain where he spent many of his formative years. As a result, he has not only developed an extensive knowledge regarding the distribution of plant and animal species, but has compiled substantial information with respect to the locations (and unfortunately the destruction) of many of the known sites in the pool floodplain.

Mr. Reed's cooperation was quite rewarding. He spent significant amounts of his time with the survey crew, in several instances provided transportation on the river, and allowed us to document his collections from several sites on the floodplain. Many other local informants provided assistance, but Mr. Reed's help was critical to the success of the survey. Several other informants were queried with regard to their knowledge of historic and prehistoric sites. However, information provided was restricted to sites of the late historic period. Informant interviews included map and on-site investigation, completion of site survey forms, and photographic documentation of archaeological collections.

Controlled Test Excavation:

Test excavations were conducted at two archaeological sites. The first investigation was implemented at an historic shell midden (47 Cr 420) with two primary objectives, the determination of post-historic alluvial deposition at the site, and the examination of the molluscan fauna. Ostensibly the latter objective held the potential to determine the first well documented extraction and processing methods of molluscan fauna during late historic times.

Two trenches were excavated at 47 Cr 420, one across the midden exposed by shoreline erosion and another outside the midden. Traditional methods and techniques were applied at 47 Cr 420. Following establishment of horizontal and vertical controls, excavation was conducted in cultural stratigraphic units which was facilitated by the exposed profile in the cut bank. Profiles and plans of the excavations were mapped and photographed. The midden was removed with matrix as a cultural unit and delivered to Dr. James Theler, Office of The Iowa State Archaeologist, for identification and analyses.

Test excavations were also conducted at 47 Cr 340 (See Boszhardt 1982: 22-40, Theler 1983: 225-232). A single two-meter excavation unit was established 13.25m distant from Boszhardt's datum (1982: 22-40) at an azimuth of 220 degrees. Three primary research objectives were sought: (1) in-situ inspection of a suspected Pleistocene-Holocene contact at the site; (2) clarification of a suspected deeply buried component; and (3) a more detailed understanding of depositional history at Cr 340.

Because of the depth of the excavation, somewhat less traditional techniques were employed. Excavation of the unit was conducted in arbitrary 10cm levels until saturated matrix was encountered. This occurred at level 7 (pool levels were quite high, ca. 10-11 feet throughout the duration of the reconnaissance derived from the guage at McGregor Lake). At level 7, the east 1/2 of the unit was left unexcavated. The southwest quarter of the unit was established as a sump to dewater the northwest quarter of the excavation. In effect, the southwest quarter was uncontrolled. This was a necessary decision made in the field in order to accomplish the set objectives.

Thus, below level 7, only the 50cm north 1/2 of the northwest one-quarter was excavated with sound vertical controls. Unfortunately, we were unable to control the south 1/2 of the northwest one-quarter of the excavation unit because of slumpage of the matrix into the sump. Dewatering was accomplished with the use of a hand siphon pump familiar to boaters (bilge pump), buckets, and the balk

between the controlled quarter (NW) and the sump (SW).

The wet silty matrix at 47 Cr 340, as at many other floodplain sites, is difficult to trowel and screen, a phenomenon noted by Boszhardt:

> An initial attempt was made to screen the first two levels of the stratigraphic unit (Pit 2) through standard 1/4" mesh hardware cloth. This proved impractical, as the moist, fine-grained silt immediately "balled up". Rather than forcing the soil through the screen, a procedure both time consuming and, more importantly, damaging to ceramics and other more fragile remains, we opted for careful troweling of the deposits and abandoned screening efforts (1982: 23-24).

Benn encountered the same problems at the FTD Site (13 Am 210): "Vertical excavation proceeded by troweling arbitrary 10cm levels and terminated at the water level (90cm in square 1 and 2; 110cm in square 4). Screening of the soil matrix was not possible due to the nature of the alluvial soil (1976: 5)." Using a technique successfully applied at 11 Jd 126 (Overstreet 1983), the alluvial matrix was water screened.

This process was accomplished by removing the excavated silt in buckets, transporting the material to the river, and soaking the earth in a series of small screens. Periodically, the screens are gently agitated to remove the fine grained sediment. Once this had been accomplished, the "washed" cultural materials were placed in plastic bags and transported to the lab for drying and processing. This gentle water screening is very tedious as the silt has to be soaked for relatively long periods of time and requires much more time than excavation. It was particularly difficult in this instance as we were forced to work quickly in the dewatered excavation unit and a ratio of 5 screens to the small control block was inadequate. The advantage to this technique is that small items which would not be recovered by shovel skimming, trowels, and conventional screening provided a more complete assemblage. The disadvantage is that the technique is very time consuming and multiple screens have to be used for each excavation level. Approximately 18 man-days were required to excavate this unit to a depth of 3m at which point the Pleistocene gravels were identified and sampled. A complete soil column was taken in 4' metal sample trays and returned to the lab for future analysis. More extensive excavations are not feasible without mechanized dewatering and shoring protection for the excavation crew.

Seismic refraction and ground penetrating radar:

Three seismic refraction stations were established. The first of these was located at the east margin of Island 169, opposite the mouth of Marias Lake and an un-named minor channel (see Plate 3). Selection of this locality was based on previous field work conducted by Peter Church (1984) during which he conducted tight interval coring of Island 169 with the objective of interpreting Holocene sediments and establishing the depth of Holocene/Pleistocene contact. Restricted to the use of hand tools, Mr. Church was unable to sample to necessary depths to secure data regarding the depth below surface of Pleistocene materials. It was our hope to be able to supplement his work with data from seismic refraction.

The second seismic line was established at the north end of McGregor Lake (see Plate 3). At this locality, multiple objectives were the discrimination of various sedimentary episodes, potential definition of sub-surface topographic features, and the depth of bedrock.

Seismic line three was established at the location of archaeological site 47 Cr 363 at the southwest margin of Bergman Island (see Plate 3). Among questions to be addressed at this locality were the depth of bedrock, determination of geomorphic features (is Bergman Island a buried terrace outlier?), and depth of bedrock.

Each seismic station consisted of one seismic line. Seismic observations were conducted parallel to the shoreline and stream flow. Changes in elevations were measured with a Brunton compass and were generally less than 2.0 feet. Seismic data were collected using a Bison Model 1580 six-channel seismograph.

Ground penetrating radar surveys were conducted at four localities: (1) the Dillman tract; (2) McGregor Lake midden; (3) Lover's Lane slough; and (4) the FTD site (13 AM 210) at the mouth of the Yellow River (refer to Plate 3 for radar survey localities). After the sites were chosen for survey, a starting point was chosen for each radar survey line at each site. The line was then measured and subdivided into 20-foot sections which were noted with an event marker on the radar data. Lateral placement of the line was controlled by surface conditions. Noting the 20-foot marks on the charts as the data were being collected simplified lab review, analyses, and enhancement of the charts.

Tests were conducted on the sites using two different transducers so that the effect of differential frequencies could be observed and the most effective transducer could be selected for site-specific data collection. The Holocene

silts were somewhat attenuating to the radiated energy. This, in conjunction with the fact that small anomolies at relatively shallow depths were being investigated, required a high resolution antenna, necessitating the use of the 500 megahertz transducer. After determining the best transducer to use, surveys were run at locations with previous boring information or where hand augering and coring could be done at the site. This allowed conversion of the time differential into depth. Depth determinations were made based on the estimated dielectric constant of the soils and the depths to interface detected in the borings.

Several potential applications were explored with the ground penetrating radar. Given the continuous sampling with GPR, our intent was to map subsurface topography and/or the lateral extent of particular geomorphic features. Our excavated sample of the Holocene/Pleistocene contact was quite small, but ground penetrating radar seemed particularly appropriate to secure additional data relating to this phenomenon at the Dillman tract. Locations that had previously been identified as the sites of buried archaeological deposits were also investigated. It was our intent to examine the potentials for discovering buried sites with the radar. Finally, geomorphic data relating to the nature of buried landscapes that had been revealed through coring and seismic refractionation could be cross-checked with the results of ground penetrating radar survey.

RECONNAISSANCE RESULTS:

By utilizing a variety of survey methods and techniques, a reasonably accurate portrayal of some segments of the lowland floodplain in Navigation Pool 10 can now be provided. In a number of instances the methods used were more rewarding than we had ever hoped. In others, primarily a result of high water conditions, reconnaissance techniques failed to provide the data yields which we anticipated. The following summaries describe the reconnaissance results for the stage I and II samples.

Stage I Sample:

As previously noted, Stage I sampling reconnaissance was directed to fulfill three primary goals. These include: (1) the confirmation through field verification of landforms and features identified by remote techniques during the preliminary geomorphic study; (2) to ascertain, in so far as possible, both from the extant data and additional field investigations, the depth of post-1800 alluvium on the floodplain; and (3) to identify both reported and unreported archaeological sites on (in) the alluvial landforms identified by Church (1984).

Field verification of landforms:

The major limitation of the preliminary geomorphic study of Navigation Pool 10 was identified by the author (Church 1982: 5). Thus, our first task, in cooperation with Mr. Church during his additional field investigations, was to evaluate the accuracy of geomorphic features delineated from review of aerial photographs. A program of on-site inspection, soil coring, and reconnaissance by boat was conducted. Geomorphic features such as mid-channel islands, lateral accretion ridges, abandoned channels, terrace remnants, and other floodplain landforms were closely scrutinized. Correspondence between geomorphic features identified in the field and those mapped by Church (1984) from aerial photographs was quite high. In one locality near Sny Magill Creek, ridges of lateral accretion that were almost imperceptible in the field had been delineated on the maps developed from air-photos.

Mid-channel islands had been characterized as geomorphic features of low potential by Church: "Mid-channel islands are recent geomorphic features and probably have little archaeological significance" (1982: 38). This contention is supported by the reconnaissance work during the Stage I sample. Further support is provided by review of pre-lock and dam maps and those of the current landscape. Mid-channel islands identified during the late-19th and early 20th centuries have been completely removed. Current maps depict these landforms in localities where none were present on the earlier maps (see Plates 8-11).

Depth of Historic Alluvium:

During the Stage I reconnaissance, numerous localities were inspected for the presence of recent historic debris that would allow for an assessment of the depth of recent alluvium in a variety of alluvial contexts. Such items as cans, bottles, wood, styro-foam, and other modern debris are commonplace along active major and minor channels. In these geomorphic contexts recent debris is found very near the surface. Burial is usually less than 40 cm below the present surface. A review of excavated sites on the floodplain serves to confirm this generalization. Theler (1983), Boszhardt (1982), Stoltman et al (1982), Benn and Thompson (1976), and our own excavations document the depth of recent alluvial deposits on lateral accretion ridges as a thin mantle of fine-grained sediment. An important bias limits the utility of this information.

With very few exceptions, accurately documented contexts of the depth of recent alluvial deposition are restricted to the crests or margins of ridges of lateral

accretion. Further, identification has been largely restricted to portions of these geomorphic features that are currently being eroded, exposing recent cultural debris in cut-banks. It is likely that in swale bottoms, abandoned channels, and other localities where vertical accretion is active, the historic silt mantle has greater depth. Investigations in Navigation Pools 12 and 16 are of interest. In Pool 16, Barnhardt et al (1983: 30) have documented the deposition of 80cm of post-dam sediments. Excavations at 11 Jd 126, in a swale bottom (Overstreet 1982: 37-38) provide evidence of approximately 60cm of recent (post-1850) sediment accumulation.

Based on the data secured during the Stage I sample, we can state that crests of lateral accretion ridges are mantled by 10-40cm of recent alluvium. Swale bottoms, abandoned channels, and other localities of vertical accretion are likely characterized by greater accumulation of recent sediments. The implications for future survey work are that recent prehistoric sites may be discovered on ridges of lateral accretion by shallow sub-surface techniques. At other localities this will be inadequate to determine the presence or absence of recent sites. In any event, the problem of determining the depth of historic alluvium, at least for purposes of archaeological survey investigations, becomes less critical based on the depth of prehistoric site burial in Pool 10.

Archaeological Site Identification:

During coring operations to investigate superimposed geomorphic features, Pleistocene/Holocene sediment relationships, and the geomorphic contexts of previously reported sites, some unanticipated discoveries were made. For example, coring conducted at the Dillman tract, south of 47 Cr 340, was extremely rewarding. A well defined Holocene/Pleistocene contact was encountered at a depth of approximately 3.0m. Of additional interest was the occurrence of waste flakes in the Oakfield soil samples at depths below 2.5m. These cultural materials, at the time, represented the most deeply buried artifacts recovered on the floodplain of Navigation Pool 10. In addition, the proximity of cultural materials to a Pleistocene surface underscored the potential for encountering early and middle Holocene surfaces on the floodplain.

The discovery of the well defined Holocene/Pleistocene contact, in part, stimulated Mr. Church to conduct tight interval coring along the Dillman tract and on Island 169, the nearest main channel geomorphic feature. It also provided substantial interest in conducting hand coring at other known archaeological site locations. An additional cultural feature, a shell midden with inclusions of burned

rough rock was discovered at McGregor Lake. The conclusions from this preliminary work suggested that deeply buried archaeological sites could be commonplace on the lowland floodplain of the Mississippi River in Navigation Pool 10.

Cutbank surveys

In our efforts to expand the sample of archaeological sites reported by earlier surveys (Boszhardt 1982, Stoltman et al 1982), additional cutbank surveys were conducted. We selected an area of the floodplain adjacent to the Harper's Ferry Terrace. Two factors influenced this selection, first, virtually no sites had been reported at this locality and we sought to obtain information regarding site distributions for purposes of comparison with data from the Prairie du Chien locality. A second factor influencing survey investigations in the Harper's Ferry locality is that the floodplain environment is distinctly different than the areas of previous surveys. The channel systems at the Prairie du Chien locality are relatively simple. The floodplain in the Harper's Ferry by contrast is marked by many abandoned channels, backwater lakes and ponds, and a series of sinuous minor channels.

More than 6 miles of shoreline were carefully inspected. Unfortunately, high water levels in the pool seriously hindered site discovery. Only two archaeological sites that had been previously unreported were encountered during the Stage I sampling of this locality. Undoubtedly, many sites simply were not visible because of the pool levels that were persistently at 10.0 feet or higher. Validity is lent to this phenomenon through our attempts to relocate known sites during high water levels. In almost all instances, previously reported sites could not be relocated when the water levels in the pool were above 10 feet. Plates 1-3 depict the differences in floodplain configurations at the Harper's Ferry locality and at Prairie du Chien.

Stage I Sample Summary:

The Stage I sample, designed as a preliminary step toward developing a more comprehensive and effective sampling program was both rewarding and disappointing. Among the most positive aspects was the field verification of geomorphic features delineated from remote techniques. This verification was a critical first step. As indicated in the scope of work (see Appendix A), one of the contract responsibilities was the incorporation of the results of the geomorphic survey into the sample design. Confirming the geomorphic environments made their use as sampling strata less equivocal.

Determination of the depth of historic sediments, at

least in terms of the geomorphic features identified as ridges of lateral accretion, was also useful. The relatively thin mantle of recent sediments on these features provides some assurance that late prehistoric sites can be located relying on traditional near-surface survey techniques. Other deposition situations such as swale bottoms and backwater lake and pond margins, will be less reliably inventoried using the same techniques.

Cutbank surveys provided very little useful information with regard to archaeological site distributions. Reliability of surface collection techniques along erosional features is very low at pool levels above 7-8 feet. Review of pool level records for 1983 indicates that effective cutbank survey could only have been conducted during the month of August. Any future inventory work employing surface collection techniques at erosional features will have to be carefully scheduled to yield reliable results.

The discovery of well defined Pleistocene/Holocene contacts, superimposed landforms, and deeply buried sites on the Navigation Pool 10 floodplain, while very exciting, has many implications. One of the questions that has to be considered is: Does the distribution of geomorphic features, and the associated distribution of archaeological sites, mirror the early and middle Holocene configurations on the floodplain? If there is correspondence, then geomorphic features could be used as valid sampling strata throughout the Holocene. However, if the landform modifications have been extensive, then recent geomorphic features would be applicable only for recent prehistoric sites. In this instance, we were faced with developing strategies to sample a three dimensional rather than a two dimensional universe. Archaeological literature addressing biophysical and cultural variables of single landscapes is extensive. Studies addressing multiple landscapes as a product of landscape evolution are not new, but have received recent emphases (see for example Bettis & Thompson 1981). In spite of this renewed emphasis, development of sampling strategies in alluvial valleys has lagged far behind landscape modeling.

One indictment of this lag is presented by Bettis and Thompson:

> Though stratigraphic and geomorphic investigations can assist archaeologists engaged in site survey and excavation, as well as in planning and management, there are important limitations. Although distributions of alluvial fills can be mapped and dated, it nevertheless remains to determine whether or not archaeological deposits are located somewhere within the three dimensions of alluvial fills in a valley. This is the paramount field

> problem dimly if at all perceived by status quo surveys. Its true scope is apparent when stratigraphic reconstructions are completed or where landscape models can be applied. The significance of this problem is obfuscated if it is transformed solely into a statistical sampling problem. Any excavations (hand excavated shafts, machine excavated trenches, or Giddings cores) are minute fractions of fill volumes. Therefore, constraints are physical and mechanical, not just statistical (1981: 11).

Some progress has been made in developing methods and techniques for effective archaeological survey in valley alluvial fills (Benn et al 1981, Bettis 1981, Barnhardt et al 1983, Boszhardt and Overstreet 1983, Overstreet 1982, and Benn and Bettis 1981). The cited studies all share an important feature; the integration of geomorphic investigations to complement archaeological survey. In spite of this, the cited studies all share a common limitation. While geomorphic principles and constructs are applied, empirical observation of buried archaeological components is statistically insignificant. Thus, one of the major goals of the Stage II sampling strategy was to address this limitation by focusing on methodologies and techniques that would provide greater empirical observation of buried archaeological components and reduce the inherent bias of exclusive investigation of erosional environments.

Stage II Sample:

Utilizing combined techniques of surface collection at cut-bank profiles, soil coring, auger probes, controlled test excavations, informant interviews, seismic refraction surveys, ground penetrating radar surveys, nine previously unrecorded archaeological sites were identified. In addition, three deeply buried components were identified at previously reported archaeological sites. Finally, substantial information relating to geomorphic contexts and sub-surface topography of buried Holocene landscapes was recovered. The following narrative summarizes reconnaissance results of the Stage II sample.

47 Cr 415: One of the few sites discovered during cut-bank survey, 47 Cr 415 is situated atop a ridge of lateral accretion that is oriented parallel to the main channel of the Mississippi River. The site exposed in the cut bank exposure, although a broken biface (2d stage preform) was found on the foreshore at the water's edge. Because of high water levels in the pool, no additional cultural materials were recovered. Site survey forms in Appendix D denote specific site locational data. Site 47 Cr 415 is interpreted as a prehistoric midden of currently unknown cultural affiliation.

47 Cr 416: This site consists of a scatter of cultural debris, redeposited on the foreshore along a ridge of lateral accretion parallel to Marais Lake opposite the confluence to Gremore Lake. Middle and Late Woodland ceramics and lithics have been recovered from the site by Mr. Al Reed of Prairie du Chien. It was not determined if 47 Cr 416 is associated with shellfish procurement or processing. High water levels during the survey precluded the determination of site extent along the eroding shoreline. Appendix D provides additional information on specific site location.

47 Cr 417: Non-diagnostic ceramics and lithics have been collected from 47 Cr 417. The current setting of the site at the tip of a small island in the East Channel at Prairie du Chien certainly does not reflect the topographic setting at the time of prehistoric occupation. Comparison of historic maps reveals that approximately the northern one-half of this island has been lost through erosion and inundation. In fact, the mid-channel island, just upstream from the island on which 47 Cr 417 is situated, was once enjoined to the larger island to the south.

47 Cr 418: Woodland ceramics and lithics have been recovered from this site by Mr. Al Reed of Prairie du Chien. The site is located at the tip of a peninsula that separated Gremore and Marais Lakes. Cultural materials were found along the foreshore adjacent to an eroding ridge of lateral accretion on the Marais Lake side of the peninsula. Appendix D provides specific locational data for 47 Cr 418.

47 Cr 419: This site is one of the very few lowland floodplain sites in Navigation Pool 10 that has yielded artifacts associated with Oneota affiliation. Situated at the confluence of Roseau Channel and Marais Lake atop a ridge of lateral accretion, this site has yielded a portion of a shell tempered vessel and a catlinite disc pipe of ostensible Orr Phase affiliation. The artifacts are in the possession of Mr. Al Reed. Appendix D presents additional specific information regarding the location of 47 Cr 419.

47 Cr 420: Located adjacent to a main channel environment, 47 Cr 420 is an historic period shell midden. The site was discovered during cut-bank survey and limited test excavations were conducted at the site. The naiad lens was removed intact and shipped to Dr. James L. Theler, Office of the Iowa State Archaeologist for identification and analysis.

As indicated in Figure 4, the midden is overlain by approximately 30-40cm of recent alluvium. The midden was situated atop a hearth which contained round and cut nails. Additional nails (1 cut, 2 round) were incorporated in the

midden sample forwarded to Theler. Table 2 presents the species of fresh water mussels identified by Theler.

This site is interpreted as an historic shell midden which likely resulted from amateur pearlers. Theler noted, during his analysis, that no heat alteration was apparent in the naiad sample, most of the shells appear to have been broken open rather than steamed open, and, that the composition of species was unusual. The 13 valves (9 MNI) of _L. costata_ (fluted shell) are rather common in small streams of southern Wisconsin but very rare in the Mississippi main stem both prehistorically and historically. This midden has more _L. costata_ valves than are represented in all of the middens analyzed on the Pool 10 main stem (Theler 1983a). The most common species present in the Cr 420 sample is the mucket (_A. l. carinata_). This species also is rather uncommon prehistorically but occurs persistently. Historically it is known to occur locally in high densities on a stable sand/sand and gravel substrate.

The test excavations at 47 Cr 420 were quite limited, but the data yield was substantial. First, the excavations provide additional information on the extent of recent alluvium as the nails recovered from the midden and hearth contexts should date to the late 19th-early 20th centuries. Second, the data provided by Theler present an interesting contrast between historic commercial and aboriginal subsistence procurement and processing patterns. Finally, the species variation and the rather unique species identified are applicable to understanding habitat changes as well as habitat reconstructions.

47 Cr 421: Lithic and ceramic artifacts, many of which may be assigned to Woodland cultural affiliation, have been recovered from 47 Cr 421 by Mr. Reed. The site is currently situated on a lateral accretion ridge at the mouth of Garnet Lake, immediately north of Snake Island. Of considerable interest is the information derived from comparison of historic maps that depict Snake Island adjoined to this site at the end of the 19th century. Undoubtedly, land-water relationships have been modified by erosion and deposition since occupation during woodland times. Appendix D provides precise site locational data.

47 Cr 422: This site harbors both historic and prehistoric components and is now situated on the east side of a minor channel that segregates Snake Island from the low terrace. The site is situated atop a ridge of lateral accretion. During the time of occupation, based on the Mississippi River Commission maps of the late 19th century, the channel did not exist. Rather, it was a slough closed on its northern margin prior to removal of the north mass of

TABLE 2: Freshwater mussels, 47 Cr 420

	Valves			
	Left	Right	MNI	%
Family Unionidae				
Subfamily Anodontinae				
Strophitus u. undulatus (Say, 1817)	3	0	3	2.21
Arcidens confragosus (Say, 1929)	1	0	1	.74
Lasmigona costata (Raf., 1820)	4	9	9	6.62
Subfamily Ambleminae				
Megnonaias nervosa (Raf., 1820)	3	5	5	3.68
Quadrula p. pustulosa (Lea. 1831)	0	1	1	.74
Amblema p. plicata (Say, 1817)	5	3	5	3.68
Fusconaia ebena (Lea. 1831)	4	1	4	2.94
Pleurobema sintoxia (Raf., 1820)	1	1	1	.74
Elliptio dilatata (Raf., 1820)	3	2	3	2.21
Subfamily Lampsilinae				
Actinonaias ligamentina carinata (Barnes, 1823)	97	84	97	71.32
Potamilus alatus (Say, 1817)	0	1	1	.74
Ligumia recta (Lamarck, 1819)	6	6	6	4.41
Subtotals	127	113		100.03
Unidentifiable Valves	4	8	-	-
Totals	131	121	136	100.03

Snake Island by erosion. Appendix D presents additional site location information.

47 Cr 423: Surface collection at the southernmost tip of Schmidt Island recovered lithics and ceramics from the exposed foreshore. Forty-seven Cr 423 is located at the south end of a north-south trending ridge of lateral accretion. A substantial amount of the southern margin of Schmidt Island has been lost to erosion since 1900. Additional information relating to 47 Cr 423 are presented in Appendix D.

47 Cr 340: Known as the Fox Deluxe Shell Midden, this site was excavated by Boszhardt (1982: 21). Materials recovered from excavation and surface collection allowed for identification of a Middle-Late Historic occupation, a Late Woodland Component, and late Ryan Phase (late Early Woodland stage) manifestation. While conducting

coring just south of Boszhardt's excavations at Cr 340, a deeply buried component was discovered.

As previously noted, a text excavation unit was established at this location to provide for an assessment of a Pleistocene/Holocene contact at approximately 3.0m below the surface and to determine the nature of the archaeological deposit which was situated below 2.3m of alluvium.

No discernable stratigraphic breaks were noted in the first 7 feet of excavation. The matrix is composed of a dark, fine grained silt with little or no abrasive quality. At 7 feet below the surface, there is a transition to a sandy silt. At approximately 8.2-8.9 feet below the surface a sandy clay to clay lens was encountered. This clay lens is situated immediately atop tightly packed gravel and sand indicative of a Pleistocene deposit. Figure 5 presents a profile of the controlled section of the excavation. It should be noted that the profile was mapped under difficult conditions as water seepage and slumpage was constant below 1.5m from the surface.

In spite of the very small sample, the occupational history of this segment of 47 Cr 340 is quite extensive. Level 1 (10cm arbitrary levels) yielded only a clamshell fragment and a water rolled pebble and level 2 was sterile. Level 3 produced another clamshell fragment. Level 4 yielded 8 burned bone fragments which were unidentifiable, 2 naiad fragments, and a single sherd of historic crockery. This depth is consistent with other localities in the pool demonstrating approximately 40cm of recent alluvial deposition. A single cord-impressed rimsherd, a triangular projectile point, 5 quartzite flakes, 2 quartzite bipolar

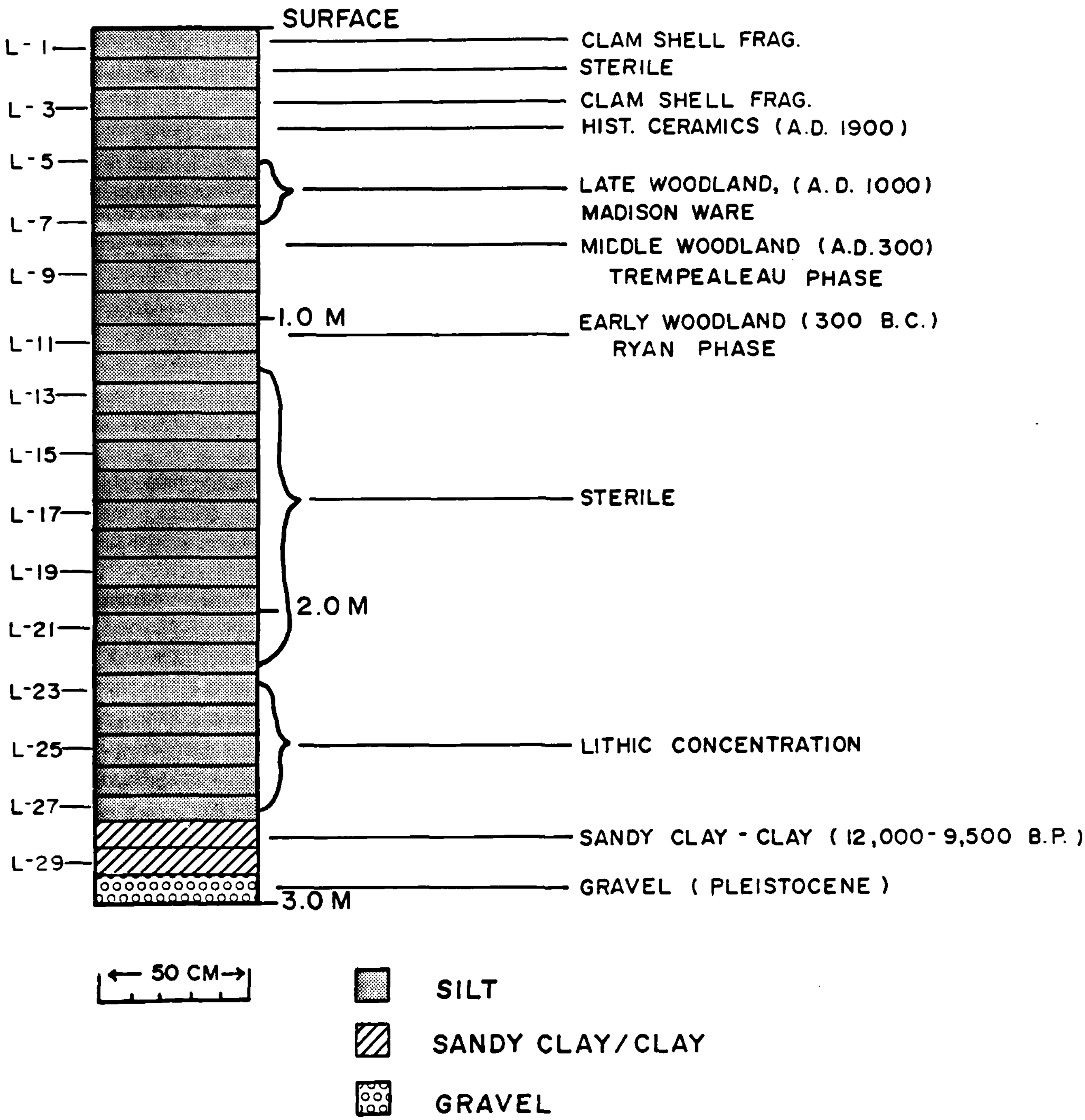


Figure 5: Profile, Test Pit A, 47 Cr 340.

cores, and a biface fragment with a ground lateral edge were recovered from level 5 and can be associated with a Late Woodland occupation. Level 6 yielded 2 cordmarked sherds from a thin-walled grit-tempered vessel, a single chert flake, and a small piece of wood charcoal, also likely affiliated with the Late Woodland occupation. Level 7 also produced Late Woodland cultural materials consisting of a broken chert triangular projectile point, 12 cord-marked grit tempered ceramic sherds of which three have cord-impressed decoration, 4 waste flakes, 2 pieces of shatter, a sizeable fragment of wood charcoal and a single piece of fire-cracked rock.

Middle Woodland ceramics were recovered from level 8. These consisted of four sherds of a single zoned, dentate stamped vessel. A fourth sherd is smooth surfaced with no decoration. Based on design motif and paste characteristics, this vessel is likely affiliated with a Trempealeau Phase occupation. Level 9 yielded only 3 small, crumbly pot sherds and a single waste flake of limited diagnostic value. Level 10 produced 12 chert waste flakes, 1 piece of shatter and 12 water-rolled pebbles.

Level 11 yielded a ceramic sherd with fingernail impressions applied to a grit-tempered fine cord-marked surface. This sherd is, based on paste characteristics, probably associated with Ryan rather than Prairie Phase occupation. Aside from a single chert waste flake in level 13, levels 12-22 were devoid of cultural materials.

A dense concentration of lithic debris was encountered in levels 23-27. Table 3 presents a detailed tabulation of the cultural materials encountered in levels 23-27. Stratigraphically, the lithic concentration is situated above a reddish-clay lens that can perhaps be dated at approximately 9,500 years B.P. (Church 1984, Flock, 1982).

Alternative interpretations of this clay should not be discounted. Church for example indicates the source may be from overbank flows resulting in vertical accretion of silt and clay (1984: 38). yet he notes for a quite similar context at Ambro Slough:

> This red clay is very similar to the red clay described by Flock (1983), believed to have been transported from the Lake Superior Basin during catastrophic flooding 13, 100 to 9,500 years B.P.

Correctly cautious, Church also states: "However, more detailed analyses are required to conclusively differentiate this red clay from the upland residual clay found in this region (1984): 39)." Thus, the 13,100-9,500 B.P. date will rightfully be questioned until more detailed analyses are conducted.

TABLE 3: LITHIC ASSEMBLAGE, LEVELS 23-27, 47 Cr 340 (Categories adapted from Van Dyke & Behm 1981)

LEVEL	Cortical Flakes Primary	Cortical Flakes Secondary	Thinning Flakes	Edging Flakes	Flat Flakes	Shatter/ Block	Biface Fragments	Total
23				1				1
24	5	5	2	2	2	1		17
25	3	20	20(1)	5	12	7(1)	1(1)	68
26	8	34	61(3)	15	30(1)	12	2(1*)	162
27	1	4	6	1	6(4)			18
% of total assemblage by class	.0639	.2368	.3345	.0902	.1879	.0751	.0112	100
Total by Class	17	63	89	24	50	20	3	266

( ) indicates frequency of heat-treated lithics
(*) indicates complete biface

A sterile zone of approximately one meter of silty alluvium segregates the lithic concentration from the Ryan Phase component. Unfortunately, none of the three bifaces recovered from levels 23-27 are diagnostic. Thus, the age of the land surfaces on which these materials occur predate the Ryan Phase (ca. 300 B.C.-A.D. 100, Theler 1983a) by an unknown duration, and, post-date the reddish clay lens (ca. 9,500 B.P.) by an unknown duration.

Analyses of the debitage reveal that the primary activity is the reduction of weathered cobbles or blocks of local chert and the production of bifaces (preforms?). Six percent of the debitage consists of primary decortication flakes (greater than 50% of the dorsal flake surface exhibits cortex) and 23% are secondary cortical flakes (less than 50% cortex exhibited on the dorsal surface of the flake). Bifacial thinning flakes represent approximately 33% of the lithic assemblage. Artifacts indicative of other behavior or function are absent in the assemblage.

The raw material is of some interest. Virtually all of lithic debitage appears to represent local materials. Further, given the nature of the cortical surfaces, it is likely that the raw materials for stone tool manufacture were selected from local gravels on the scoured terrace surface. If this is true, the component comprised of lithic materials in levels 23-26 at 47 Cr 340 may reflect a lithic procurement and processing station prior to the encroachment of the floodplain on the terrace edge. The assemblage shares some attributes with the component identified as Late Archaic at 47 Cr 186, the Mill Pond Site, situated 100m north of Cr 340 (Theler 1983a). These comparisons are hindered by the very small excavated sample at Cr 340 and the published analysis of the lithic materials from Cr 186 and should be considered tentative. First, the percentages of local material in both instances is very high. Second, the biface reduction activities are similar. Third, the density of lithic debris is extremely high. Whether or not the living surfaces, 1.1-1.65m below the surface at Cr 186 and 2.4-2.8m below the surface at Cr 340, are of the same age remains to be determined by further excavation. If this is borne out, it will provide important insights relating to early-middle Holocene topography of the Prairie du Chien terrace.

McGregor Lake: The west shore of McGregor Lake has been collected for several years by local avocational archaeologists. Stoltman and Theler reported this site (1980) and it was subsequently assigned codification number 47 Cr 354. Another codified site, Cr 369 is situated south of Cr 354. Stoltman and Theler indicate a lengthy occupation sequence at McGregor Lake:

> This site on the west shore of McGregor Lake stretches along the shoreline for 1.4km. The south-southwestern two-thirds of the shoreline appears to be largely Late Archaic, producing Durst-stemmed points. The north-northeastern shoreline has produced Middle Woodland Havana pottery with concentrations in some areas apparently represent (sic) eroded features. Large portions of this site are probably intact at the present time. Survey along the eastern shore of McGregor Lake failed to produce any cultural material (1980:13).

Mr. Reed has a sizeable collection of diagnostic projectile points from 47 Cr 354 (see Plates 12-13, Appendix C) including numerous Archaic and Woodland types. All of this material was collected from the foreshore during low-water stages. During our several visits to the site the shoreline was completely inundated.

Peter Church, James Knox, David Berwick, and I conducted soil coring at 47 Cr 354 with Oakfield hand tools and discovered a shell midden buried by 9 feet of alluvium. Fragments of charcoal and burned rough rock foster the interpretation of this midden as a cultural deposit. Additional auger investigations and remote sensing provided evidence of shell middens buried at 9, 10, and 14 feet below the surface. Details of these features are provided in later discussions.

13 Am 210: The FTD site has several identified Woodland components, the Havana-bearing midden component situated below 110cm in FTD area 2 (Benn & Thompson 1976: 8). Three additional components that predate the Havana-related component were discovered during auger investigations at 13 Am 210. Charcoal, shell, and burned rough rock were recovered from 8.2-8.6 feet below the surface. Charcoal, burned bone, and burned rough rock were encountered at 9.5-10.0 feet below the surface. The deepest component was identified at 11.5 feet below the surface with cultural materials represented by chert waste flakes, charcoal, bone, and rough rock. This lowest component is situated .5 feet above a clay lens at a depth of 11.2-11.6. This stiff reddish clay represents a 9,500 B.C. surface.

Lover's Lane Slough: During the remote sensing and archaeological reconnaissance, Mr. Al Reed identified the location of a shallow buried shell midden at Lover's Lane Slough. For many years Mr. Reed has examined crawfish burrows for the presence of shell or other cultural materials. In this instance, sub-surface investigations revealed the presence of a midden with two discrete shell lenses, 3.0 and 4.3 feet below the present surface. No cultural materials were recovered and at this time, the site has not been assigned a codification file number. Given its location on a ridge of lateral accretion, there is little doubt that the origins of the midden are cultural rather than natural as many fragments evince thermal alteration.

Soil Coring:

Soil Coring was conducted at many locations to verify the geomorphic features identified by Church (1984) for Navigation Pool 10. In addition, soil coring was conducted at several known archaeological site localities to determine the geomorphic context of buried components. Tools utilized for these investigations were Oakfield 1" soil samplers with extensions and a 3" modified Iwan pattern earth auger. These hand tools could only be employed to a depth of about 15 feet below the surface. Soil coring was also employed as a continuous check of radar strip charts in the field. Detailed logs were made at 6 specific locations. These locations are addressed below and are identified on Plates 8-11.

Log 82-27:01

This core is located on the Dillman Tract on the west margin of the Prairie du Chien terrace just south of 47 Cr 340. The core indicates that approximately 9 feet of alluvium has been deposited since the terrace was scoured during late Wisconsinan catastrophic floods. Slack-water clay deposits derived from the Superior and Agassiz basin were first deposited about 12,000 B.P. (Clayton 1982, Flock 1982). Following an unknown interval of floodplain accretion of silts and sands, the lowland floodplain encroached upon the terrace margins. Cultural materials at this locality (refer to Figure 5) denote the deposition of 1.2m of silt from approximately 300 B.C. to present. From approximately 7,000 B.C. to 300 B.C. 1.6m of sediments were

BORING LOG
I.D. NO. 82-27:01
LOCATION: 47 Cr 340 (Dillman Tract)

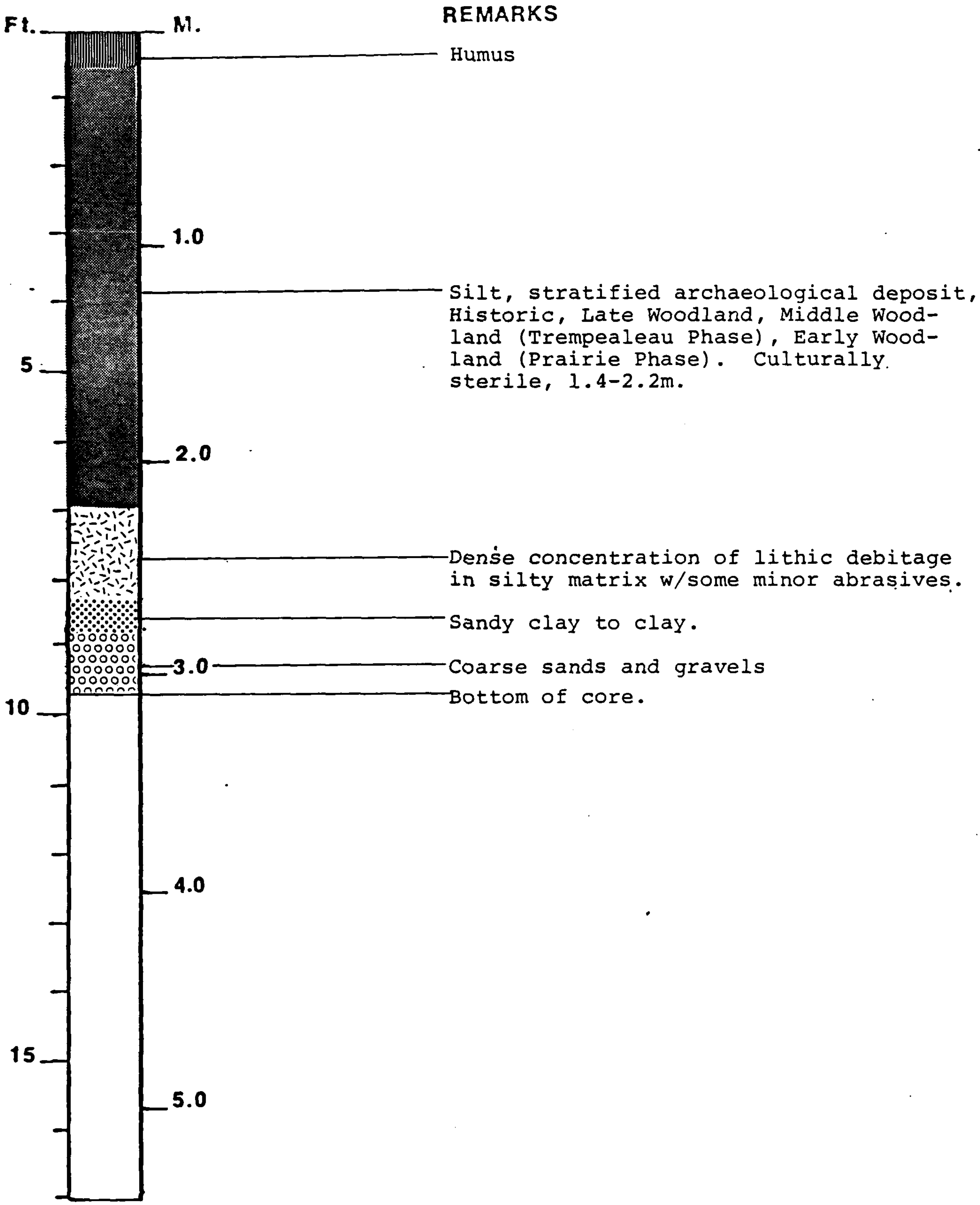


Figure 6: Log 82-27:01.

deposited on the clay slack-water deposits. Unfortunately, no diagnostic materials were recovered and the ages of Holocene surfaces below 1.2m on the Dillman Tract are unknown. Figure 6 provides the boring log for this locality.

Log 82-27:02

A core taken at the FTD Site (13 Am 210) at the mouth of the Yellow River indicates at least 4.0m of Holocene deposits. At the time of Benn and Thompson's excavations (1976), cultural deposits provided relative dates for the uppermost 1.1m. The Havana-related midden at that depth can be dated to approximately A.D. 100-200 (Theler 1983a: 18). Three buried components at this site, 2.7, 3.2, and 3.8m below the surface pre-date the Havana-related component by unknown numbers of years. Their stratigraphic position above the stiff reddish slack-water clay suggests that they are later than 9,500 B.P, keeping in mind that these time-stratigraphic correlations are tentative (Flock 1982). Figure 7 provides a boring log for this location.

Log 82-27:03

Three buried cultural deposits have been identified at the west shore of McGregor Lake. Earlier surveys (Stoltman and Theler 1980) have identified Late Archaic materials from cut-bank surveys. Estimates of the position of these artifacts in relation to fluctuations in pool levels can be used to infer ages of the uppermost 2.0m of silts. The occurrence of styles related to Raddatz side-notched and Durst Stemmed span a period from 3,000-700 B.C. (Stoltman 1983) and they ostensibly are found within 2.0m of the present surface. The deeply buried deposits are situated on Holocene surfaces that pre-date the Late Archaic period by an unknown magnitude. Further, it is likely that the 15 feet of matrix we were able to sample at McGregor Lake, based on boring logs from the Prairie du Chien bridge footing, are composed of Holocene deposits. Figure 8 depicts the boring log at McGregor Lake.

Log 82-27:04

Coring was conducted on a ridge of lateral accretion adjacent to Lover's Lane Slough at the site of a suspected buried shell midden. This is no longer an active channel, but was likely utilized for shellfish extraction and processing during the time when the channel was active. As indicated in the boring log that appears as Figure 9, two discrete shell lenses were discovered buried at depths of 1.0 and 1.4m below the surface. No cultural materials were recovered at this locality, however, the shell has been thermally altered indicating that the midden is a cultural fea-

BORING LOG
I.D. NO. 82-27:02
LOCATION: FTD Site (13 AM 210)-Yellow River

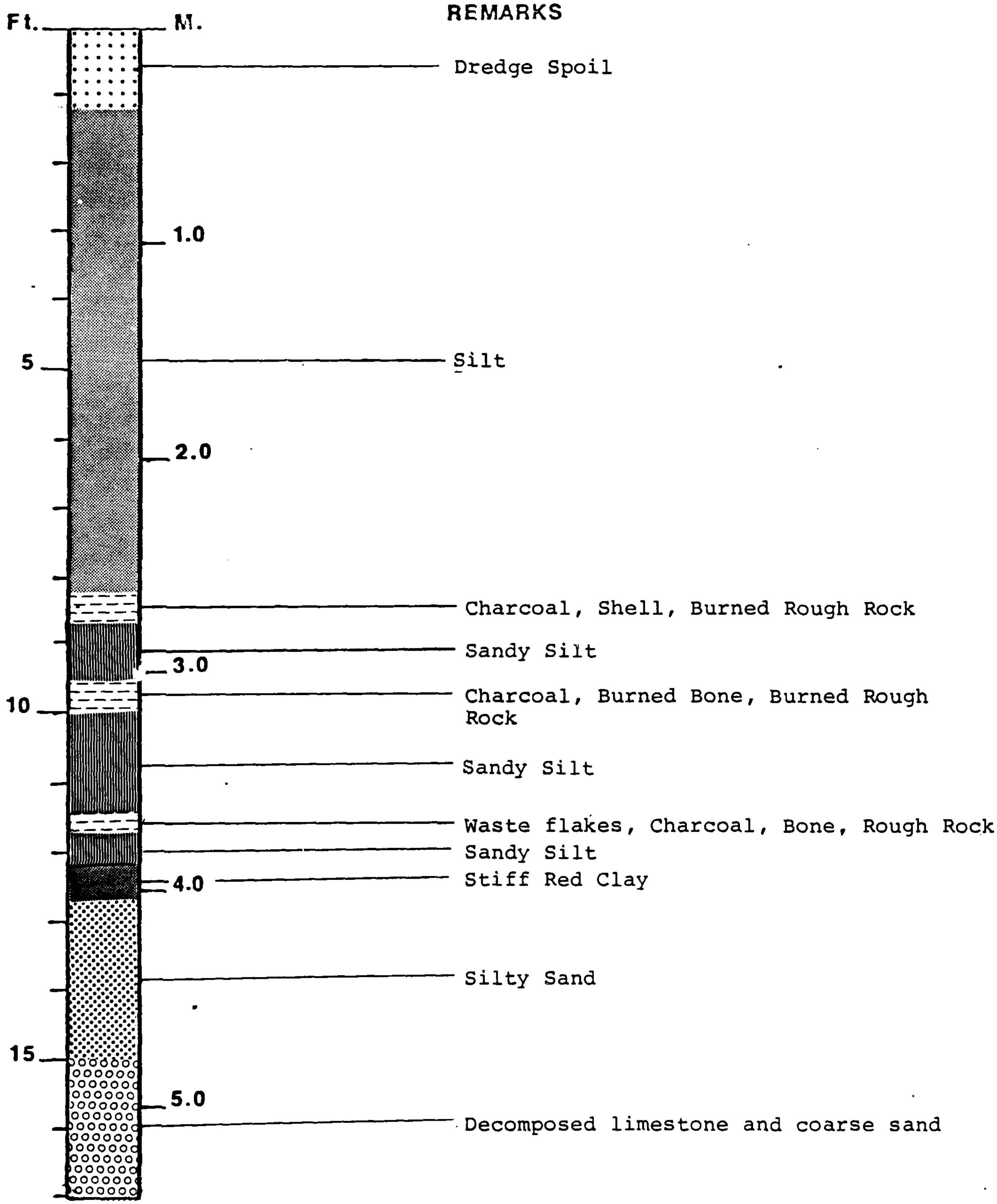


Figure 7: Log 82-27:02.

BORING LOG
I.D. NO. 82-27:03
LOCATION: McGregor Lake (west shore)

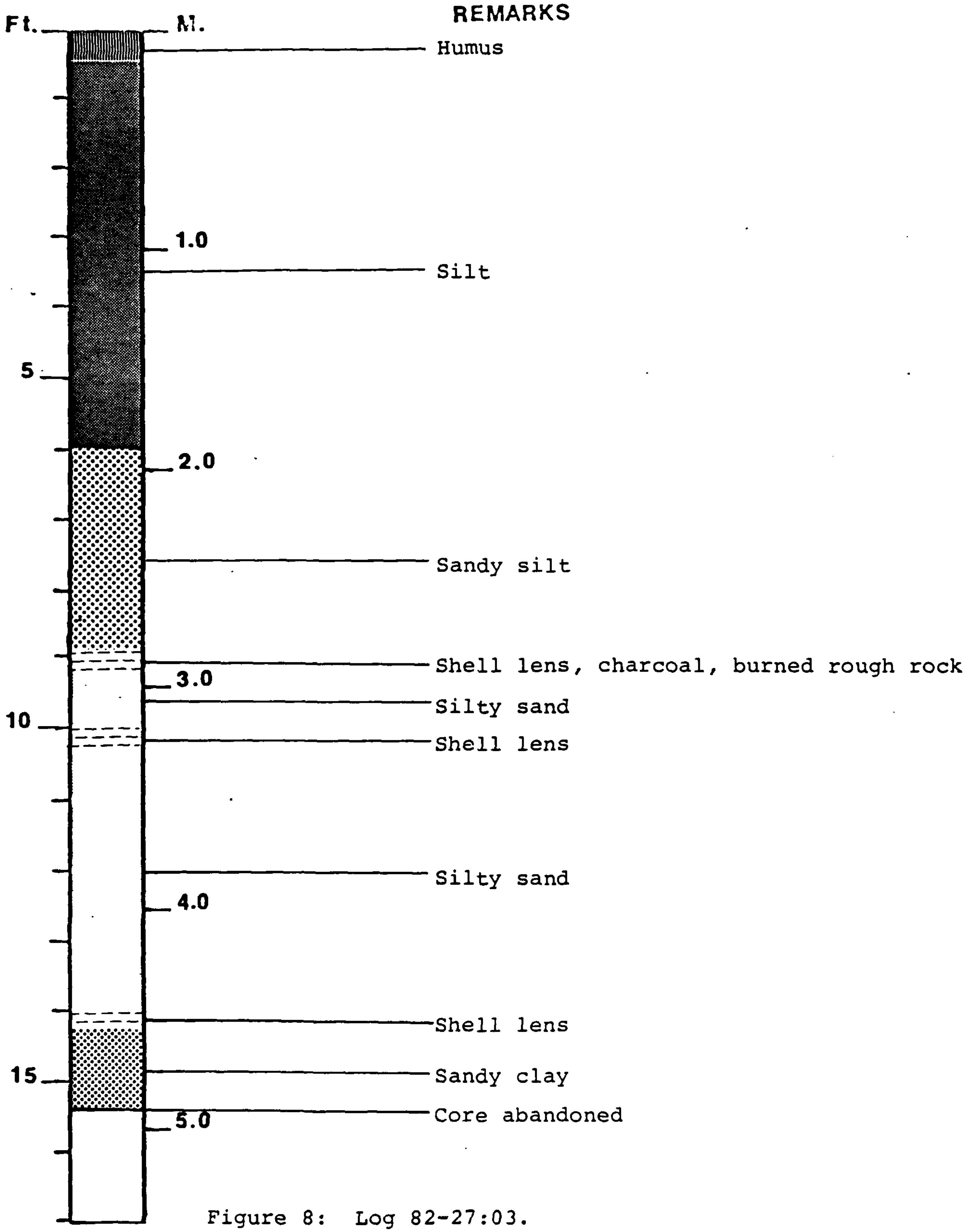


Figure 8: Log 82-27:03.

BORING LOG
I.D. NO. 82-27:04
LOCATION: Lover's Lane Slough (McGregor Lake)

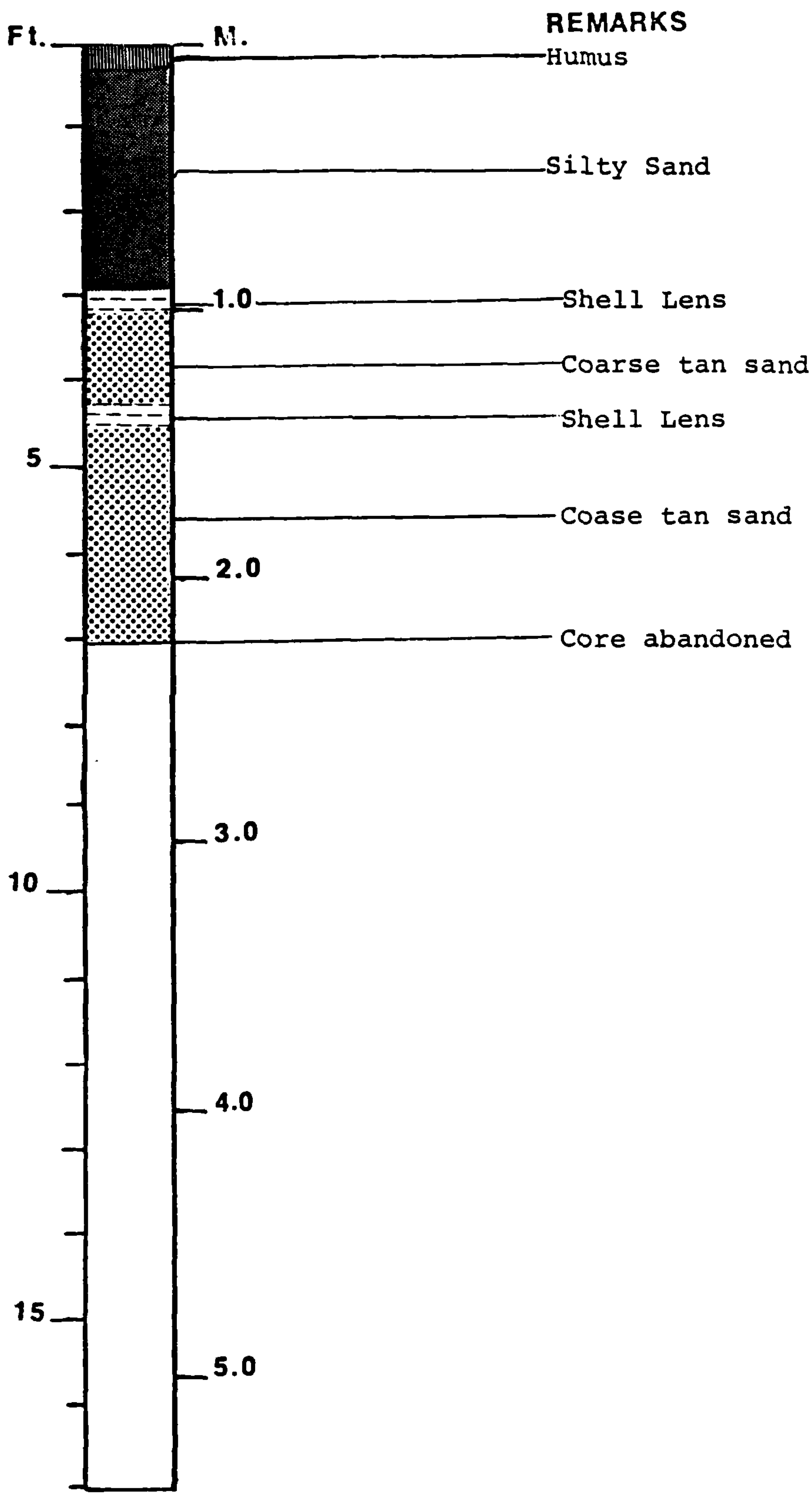


Figure 9: Log 82-27:04.

ture. At this locality, only 1.0m of fine grained silts have been deposited atop a coarse tan sand. The depth of this sand is unknown as bit refusal was encountered slightly below two meters. This was a common occurrence in coarse sands below the water table because the saturated sediments collapse in the bore hole. It is plausible that the sediments reflected in the log at 82-27:04 are all Holocene deposits. The age of the shell middens remains to be determined.

Log 82-27:05

Theler's excavations at the Mill Pond site (47 Cr 186) revealed that a rather thin mantle of silt capped a coarse sandy stratigraphic unit (1983). Coring was conducted at the Mill Pond site immediately south of Theler's excavations in an attempt to determine the depth of the sand unit and to ascertain the depth of Pleistocene gravels which had been found at a depth consistent with Theler's report, approximately 1.8m below the surface. The sand unit extends to a depth of at least 4.0m below the surface. Again, the core was abandoned when the coarse sand sediments collapsed in the bore hole causing bit refusal. It cannot be determined at this time whether or not the sediments are Pleistocene or Holocene in origin. Figure 10 presents log 82-27:05.

Log 82-27:06

To date, the oldest artifact recovered from a floodplain context is the base of an Agate Basin projectile point found by Mr. Reed at Hunter's Channel on the west shore of Schmidt Island. A core was taken within 10 feet of the find locality. Approximately 3.8m of sandy silt overlie a sandy clay unit. The clay content appears to be minimal and it is difficult to determine if this represents a surface of similar age and composition to the clay units at the Dillman tract, the FTD site, and Ambro slough (Church 1984). If this sandy clay is derived from Lake Superior/Lake Agassiz basin sediments the slack-water deposit should date to approximately 9500 B.P. Certainly, the 3.8m of sandy silts represent Holocene deposits. No cultural materials were recovered during coring and auger investigations at this locality. Figure 11 is a rendition of the core at Hunter's Channel.

Soil coring and auger investigations provided significant information regarding the depth and nature of Holocene and Pleistocene deposits on the terraces and Holocene alluvium on the insular units of Navigation Pool 10. On the terraces, the Holocene matrix is much less extensive than on the islands. Surveys can be conducted where the entire Holocene matrix, and thus the archaeological record can be sampled within approximately 3.0m of the surface. Unfortu-

BORING LOG
I.D. NO. 82-27:05
LOCATION: 47 Cr 186 (Dillman Tract)

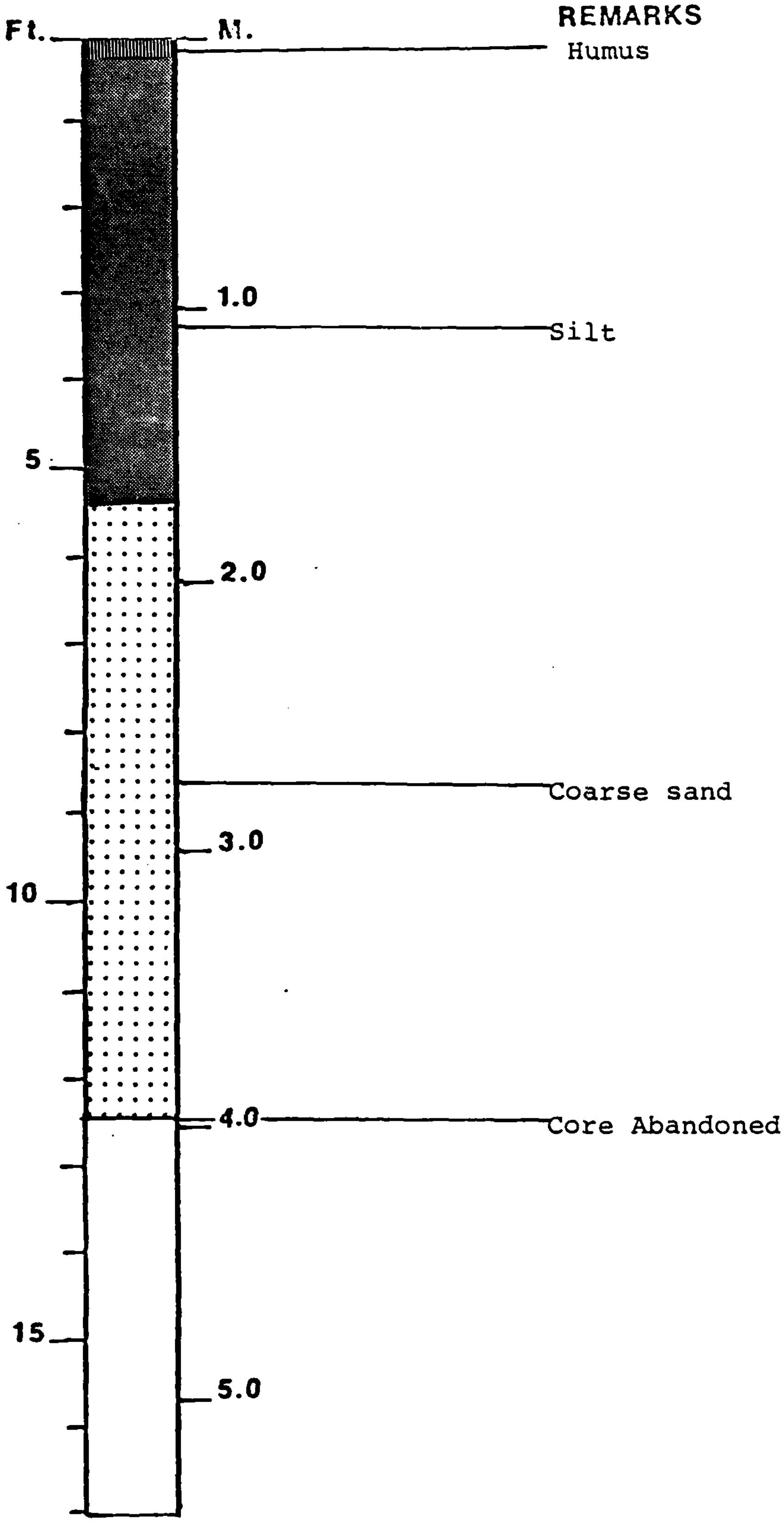


Figure 10: Log 82-27:05.

BORING LOG
I.D. NO. 82-27:06
LOCATION: Hunter's Channel

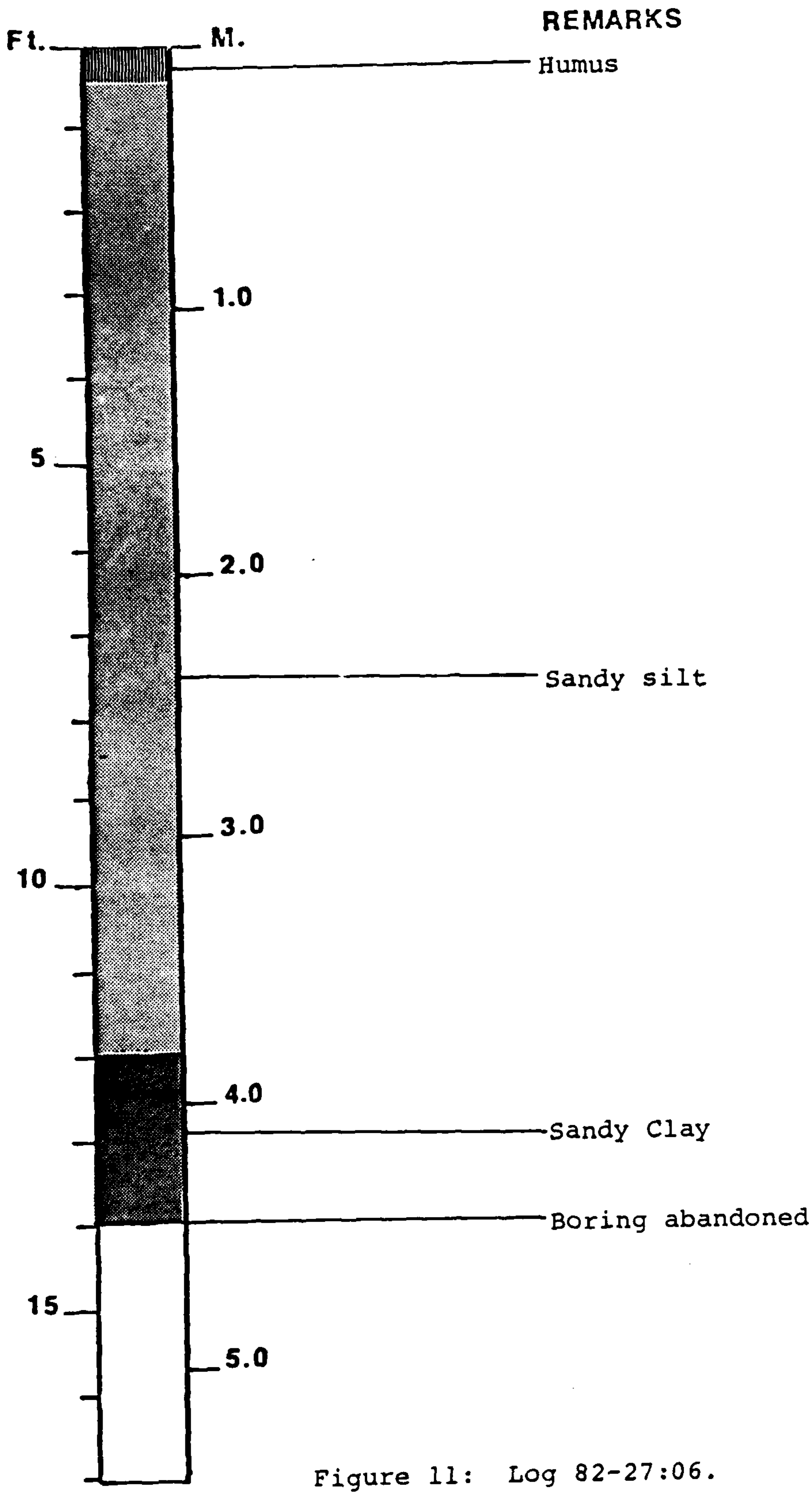


Figure 11: Log 82-27:06.

nately, the chronology of sediments deposited on terrace margins is incomplete. Sufficient data are available to date depositional processes during the last 2,000 years. Prior to this time, no reliably dated archaeological contexts are known. Nontheless, it is clear that such deposits do exist and can be investigated to clarify the sedimentary record between the years 9,500 and 2,000 B.P.

Holocene deposits on the islands in Navigation Pool 10 are of greater depths than those on the terraces. The limitations of hand tools resulted in our inability to identify Holocene/Pleistocene contacts in these geomorphic contexts. In all cases, they appear to extend beyond 15 feet below the present surface, a phenomenon supported by the few boring logs available for the floodplain localities away from the terraces. Church notes the depth of Holocene sediments in two locations, Island 172, and, beneath the east and west channels along Highway 18 at Prairie du Chien as approximately 40 feet and greater than 100 feet respectively (1984: 14-15). These depths were derived from boring logs associated with the construction of the new Highway 18 bridge. Remote sensing provided answers to some of the questions unresolved by coring and auger investigations.

Remote Sensing:

Seismic refraction survey:

Seismic survey was conducted at three localities which are indicated on Plates 8-11. Stations were established at 47 Cr 363 (southwest quadrant of Bergman's Island), The area north of McGregor Lake on Island 172, and on the east shore of Island 169. Analyses of all seismic lines show the presence of two layers with velocities and thicknesses summarized in Table 4. In addition, a third layer was interpreted at two stations. The first layer is considered to portray Holocene silts, based on velocity of seismic wave and confirmed by near-surface (15') coring, the second layer represents coarse sediment (sand based on the Prairie du Chien boring logs), and the third layer is interpreted as mixed sand and gravel.

Velocities for the first layer ranged from 650 feet per second to 1,200 feet per second (fps). Values less than 4800 fps should not be found under saturated conditions. However, low velocities are often found when surveys are taken in low density, muck type soils. The plotted first arrival time may actually be an air arrival or be caused because of a change in seismic wave frequency. Calculations based on these velocities result in reasonable determinations of the thickness of the silt. However, should additional surveying be done, a smaller geophone spacing

should be used and exact calibration of the seismic data, with bore hole information, should occur to better understand the cause of these theoretically impossible low velocities.

Velocities encountered in the second layer are characteristic of firmly consolidated gravels, soft sandstone, or coarse sand. In this instance, boring log information denotes coarse sand. The velocity of this layer ranged from 4,700 feet per second to 5,675 feet per second. The depth to the interface as indicated by the travel time of the wave to the second layer was calculated based on the velocities from the first and second layers. It varies from 11.7 feet to 14.4 feet. At Cr 363 (Bergman's Isle), a slope in the elevation of this interface is indicated. Perhaps this information will ultimately be of utility in reconstructing the topography of early Holocene landscapes. At McGregor Lake (Island 172) and Island 169, the depth remained constant over the seismic line and indicated a horizontal interface. Specifically, it was at a depth of 14.4 feet at McGregor Lake and 13.0 feet at Island 169 (refer to Table 4 and Figure 2).

A third layer was interpreted at the McGregor Lake and Cr 363 (Bergman's Isle) stations. At McGregor Lake, the depth to bedrock was calculated at 80 feet with a velocity of 6,400 feet per second. This velocity is typical of soft or weathered sandstone. At the Cr 363 station, the velocity of the third layer was 5,500 feet per second which resulted in a depth of 60 feet. The velocity calculated at this station seems to be slow for the conditions as presently interpreted. In addition, the change in slope on the time-distance curve is subtle and may not represent an actual change in slope. Therefore, the calculated depth to bedrock appears to be too shallow and additional boring information is necessary to substantiate seismic wave velocities through the sandstone. Tentative interpretation of Layer 3 is sand and gravel.

Of importance here is the substantiation of the interface between fine and coarse sediments, particularly at Island 169 and Island 172. Mr. Church's tight interval coring (1984) at Island 169 was conducted with hand tools. Therefore, the depth of the investigations was limited. Mr. Church collected his soil samples from depths of approximately 12 feet. None of the cores yielded data which would ellucidate the fine/coarse interface. It has been determined through the use of seismic refraction survey that this interface is situated at a depth of approximately 13.0 feet at the Island 169 locality to 14.4 feet at McGregor Lake (47 Cr 363). It is unlikely that this represents a Holocene/Pleistocene contact, a question that remains to be

TABLE 4

SEISMIC DATA - NAVIGATION POOL 10

Seismic Station	Average Velocity (feet/second)			Average Depth from Land Surface (feet)		Geologic Interpretation		
	V1	V2	V3	V2	V3	V1	V2	V3
47 Cr 363 (Bergman's Isle)	925	4,850	5,500	11.7 (dipping)	60	Loose silty soil	Coarse sand	Sand and gravel
McGregor Lake (Island 172)	1,090	5,290	6,400	14.4	80	Loose silty soil	Coarse sand	Sand and gravel
Island 169	700	5,000	-----	13.0		Loose silty soil	Coarse sand	Sand and gravel

resolved by deep excavations or tight interval mechanized coring.

Ground Penetrating Radar:

Ground penetrating radar survey was conducted at four localities in Navigation Pool 10. Investigations were designed both to secure information relating to geomorphic contexts and to assess the utility of this remote sensing technique as an archaeological survey tool. GPR survey tracts are identified in Plates 8-11.

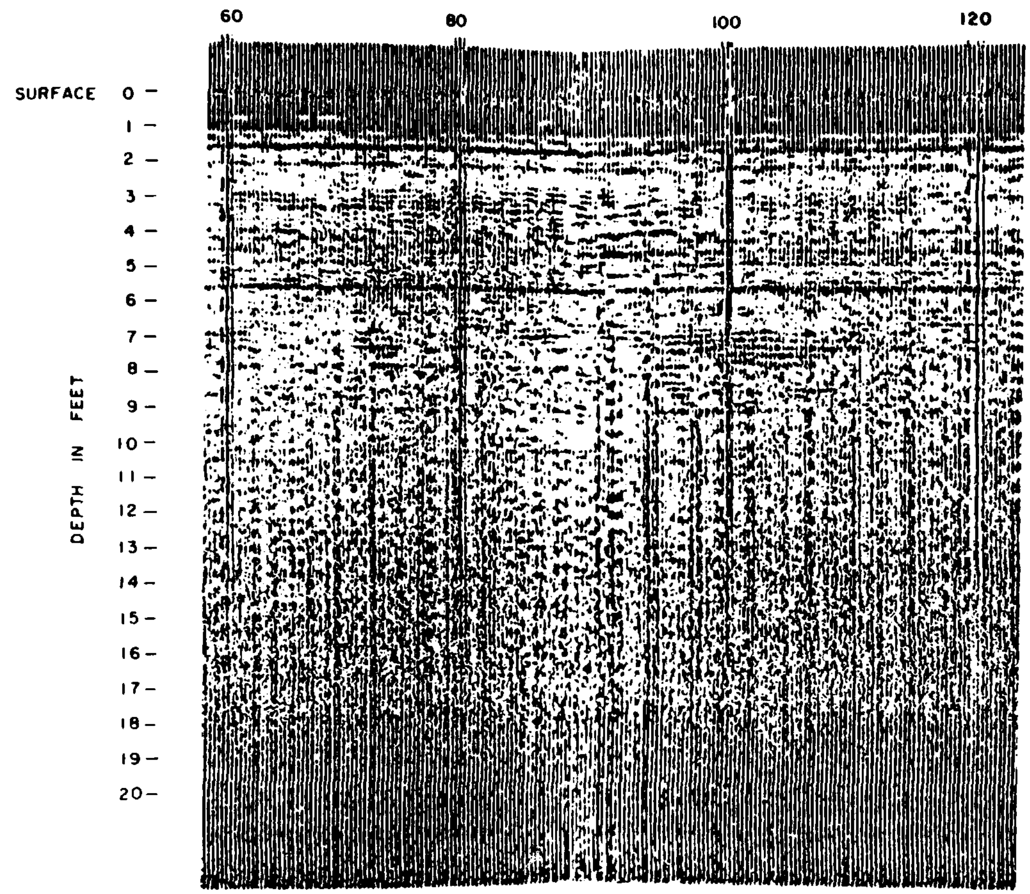
Dillman Tract:

At this location radar transects were employed to secure a larger sub-surface sample of the Pleistocene/Holocene contact discovered through coring operations and to attempt to determine the lateral extent of the buried lithic concentration at 47 Cr 340. The radar segment at Dillman's was divided into five subsections labeled A through E. Segments A-C were run in the southern portion of the tract (at Cr 340). The datum stake placed by Boszhardt (1982) corresponds to the 300-foot marker along segment B. An area along the shoreline at the Dillman tract was not surveyed, so segments C and D were not contiguous. Segments D and E were run at the known midden site 47 Cr 186 (the Mill Pond site). The midden is located at the 65-foot marker along segment D. Each segment is described in general, followed by a detailed description of the radar results for a 20-foot length.

Segment A - 0 to 140 feet (Figures 12 and 13):

Segment A displayed relatively strong return signals for the duration of the line. A fairly continuous interface between the Holocene silts and Pleistocene gravels was detected. Some stronger reflections occurred below the silt/gravel interface which may be because gravel will transmit the radiated energy much more readily than finer grained materials. Above the silt/gravel interface numerous small, lateral anomalies were seen. These may be the result of either an archaeological deposit or a geologic inhomogeneity such as a sand lens.

Figures 12 and 13 are representations of a portion of Segment A between 80 and 100 feet. Figure 12 represents the field strip chart while Figure 13 depicts the lab processed chart. Hand augering was conducted during the radar survey to help calibrate the radar data. This boring indicates silts from 0 to 7 feet and gravels below 7 feet. Since hand tools could not penetrate the gravels to a significant depth it is not known how thick the gravel deposit is, or what the stronger interface below the silt gravel interface repre-



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OF UPPER MISSISSIPPI RIVER, POOL 10,
NEAR PRAIRIE DU CHIEN, WISCONSIN

FIGURE 12
UNPROCESSED, RADAR STRIP CHART FROM DILLMAN'S SURVEY, SEGMENT A
80 - 100 FEET

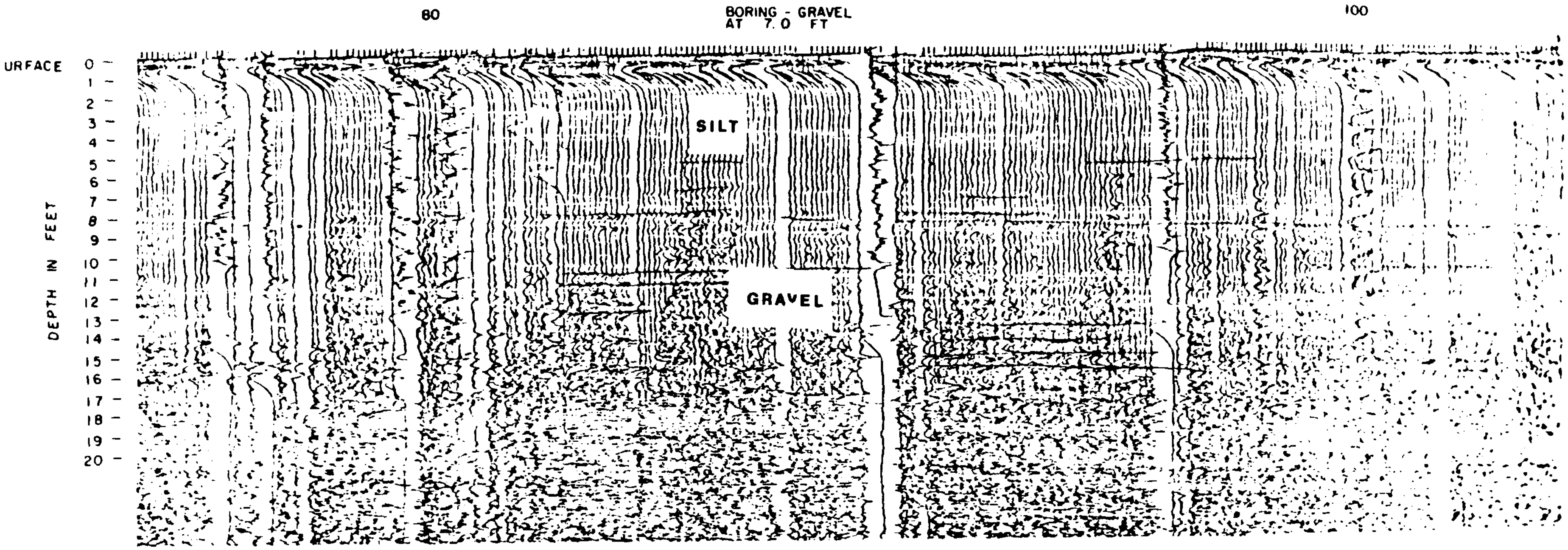

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FIGURE 13
ENHANCED RADAR WAVEFORMS FROM
DILLMAN'S SURVEY, SEGMENT A
80 - 100 FEET

sents. Other anomalies detected by the radar survey are also delimited in Figure 13.

Segment B - 140 feet to 320 feet (Figure 14:

Northward along the survey line in Segment B the Holocene silts appear to be more uniform and sandier. Few anomalies are seen in the upper portion of the material (Holocene silts) with relatively uniform conditions throughout the length of this segment of the survey. The Holocene/ Pleistocene interface is not always apparent throughout the segment. However, in those areas where coring was done to calibrate the radar signal with on-site conditions, the interface, as detected through the coring, was also apparent on the radar charts.

Figure 14 depicts a portion of Section B between 260 feet and 280 feet. In this area a strong reflection was detected at the silt/gravel interface. A previous boring in the area (at 47 Cr 340) indicated silt from 0 to 7 feet, lithic debitage from 7 to 8 feet, sandy clay from 8 to 9 feet, and coarse sands and gravels below 9 feet. The radar reflection correlates to the silt/gravel interface in the boring. Notably, the interface dips to the north indicative perhaps of the topography of an earlier land surface now obscured by Holocene deposition.

Segment C - 320 to 500 feet (Figure 15):

Segment C shows a fairly strong return from the silt/ gravel interface over much of the line segment. The silts tend to be much sandier which may account, in part, for the numerous, smaller lateral anomalies seen within the silt, above the silt/gravel interface. Since the radar wave will travel more easily through coarser, less conductive materials, more energy may be reflected back to the receiver. Some of these lateral anomalies may represent archaeological deposits, shell middens, lithic scatters, or other cultural debris. Below the silt/gravel interface numerous and distinct interfaces are seen. They are within the Pleistocene deposits but the exact nature of these interfaces cannot be determined since there is no boring information at this depth.

Segment D - 0 to 160 feet (Figure 16):

Segment D is located north of and is discontinuous with the previous three segments. A 65-foot mark along Segment D corresponds to the location of the shell midden at 47 Cr 186 (Mill Pond). The alluvium in this portion of the Dillman tract survey becomes much sandier. There does not appear to be a distinct interface between the silt and gravel. Three possible explanations are as follows: (1) the interface is

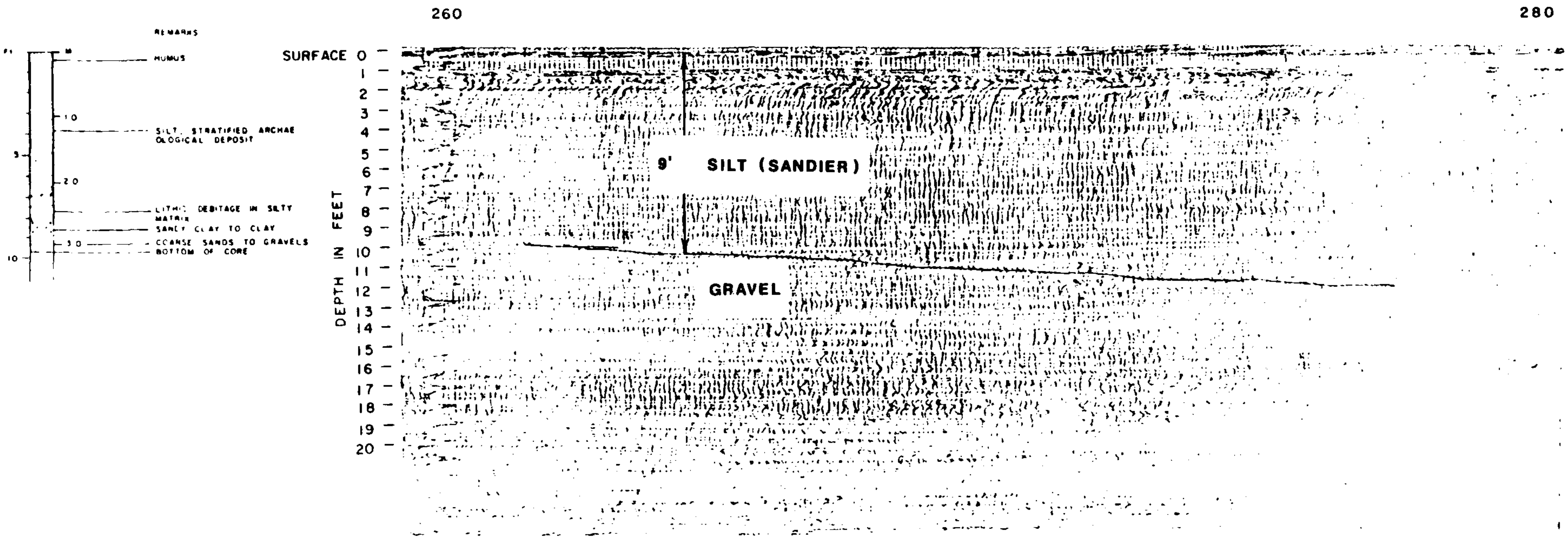

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FIGURE 14
ENHANCED RADAR WAVEFORMS FROM
DILLMAN'S SURVEY, SEGMENT B
260 - 280 FEET

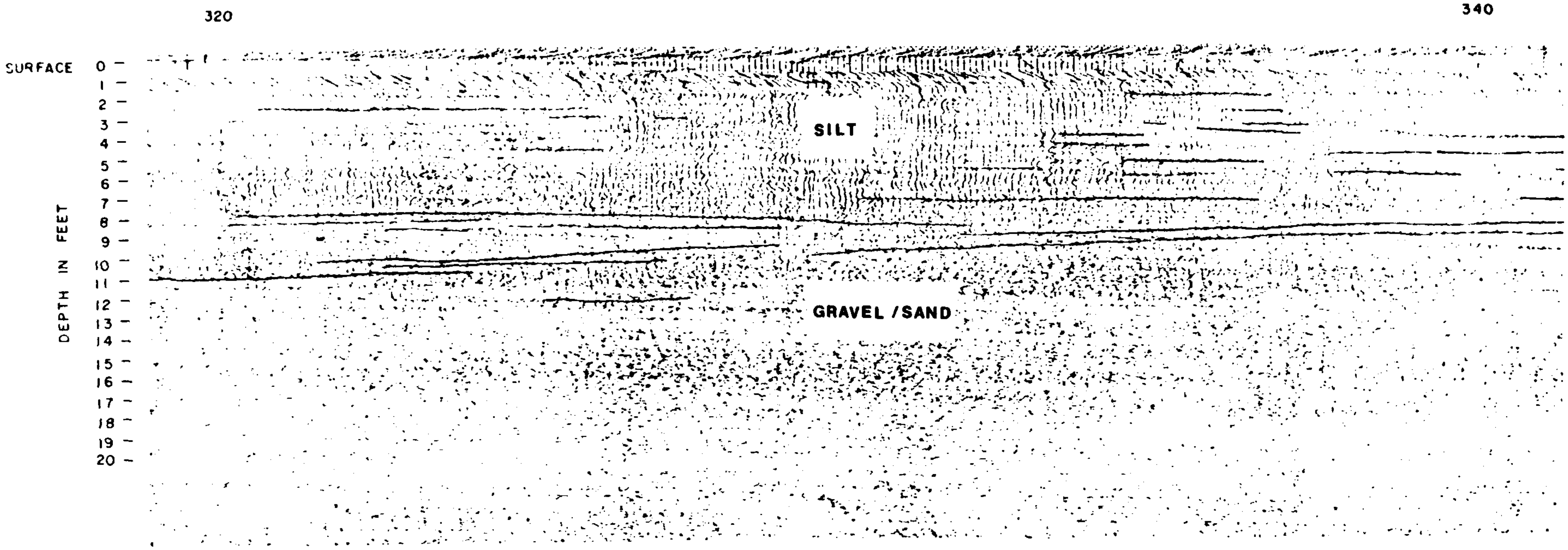

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FIGURE 15
ENHANCED RADAR WAVEFORMS FROM
DILLMAN'S SURVEY, SEGMENT C
320 - 340 FEET

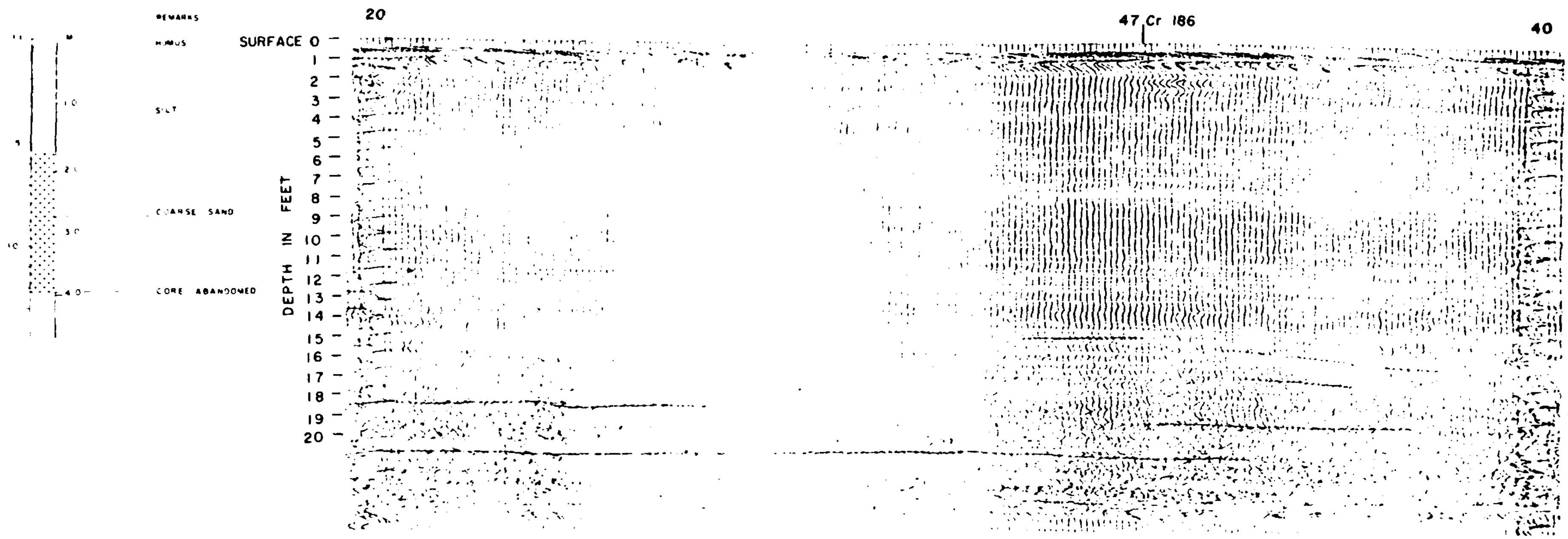

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FIGURE 16
ENHANCED RADAR WAVEFORMS FROM DILLMAN'S SURVEY, SEGMENT D
20 - 40 FEET

not present at this location; (2) since the silt is much sandier the dielectric constant might not be great enough to be detected by the radar, or (3) the contact is gradational. Some small but distinct interfaces are seen in the upper 15 feet of sediment. The boring at 47 Cr 186 is located at approximately the 35-foot mark. Although a prominant interface is not seen between the silt and the coarse sand as shown in the boring, there does appear to be an interface at a depth of approximately 14 feet. This may represent a sand/gravel interface, however, because bit refusal occurred at 12 feet below the surface, the nature of the interface could not be verified. A shell midden, occurring between approximately the 60 and 70-foot marker is not readily apparent on the radar strip chart. However, there is a lateral anomaly approximately 2 feet in length which corresponds to the location of the midden but is at a depth of approximately 13 feet. North of the midden, the material below a depth of approximately 12 feet appears to become much more gravely. A discontinuous but fairly consistent interface is seen at this depth and may represent an interface between the coarse sand and the underlying gravels.

Segment E - 160 - 340 feet (Figure 17):

Segment E shows a discontinuous interface at a depth of approximately 10 feet. Several near surface anomalies are seen in this section as shown in Figure 17. In addition, there are some anomalies contained in the silt material, although they are not as numerous as in portions of previous sections. The portion of the segment between 180 and 200 feet indicated a fairly continuous interface at approximately 9 to 10 feet. another strongly reflective interface is seen below this first one, especially between 190 and 200 feet. Smaller anomalies contained within the silt are also delimited.

McGregor Lake:

Two radar lines were run over the shell midden discovered at McGregor Lake. The first survey line was run perpendicular to the shoreline, while the second was run parallel to the shoreline. Radar data from the perpendicular line indicate anomalies which may correlate to the stratified shell middens. The materials above the midden tend to be fairly uniform although some smaller anomalies are seen between the depths of 0 to 13 feet. Some of these anomalies, especially at a depth of 5 to 6 feet, are quite strong and laterally extensive. It is not known what these interfaces represent. At a depth of 13 to 14 feet a relatively constant interface is seen which may represent the interface between sandy silts and coarse sand. A boring along the west shore of McGregor Lake indicates silt from 0 to 6 feet, and sandy silt

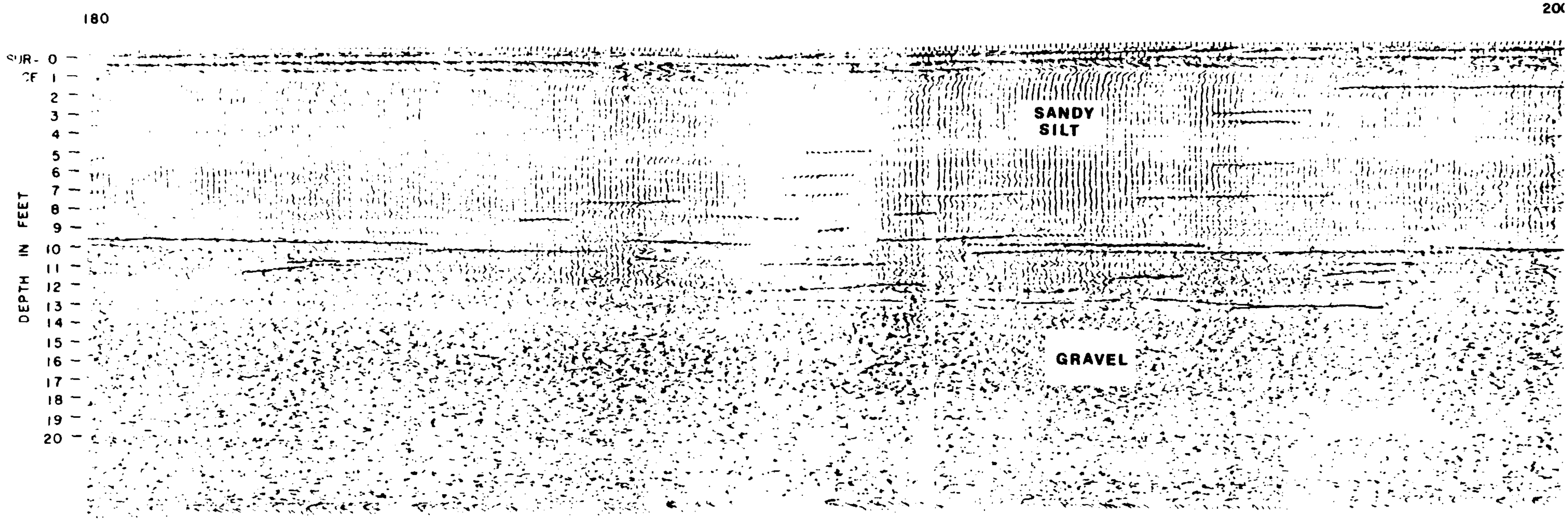

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FIGURE 17
ENHANCED RADAR WAVEFORMS FROM
DILLMAN'S SURVEY, SEGMENT E
180 - 200 FEET

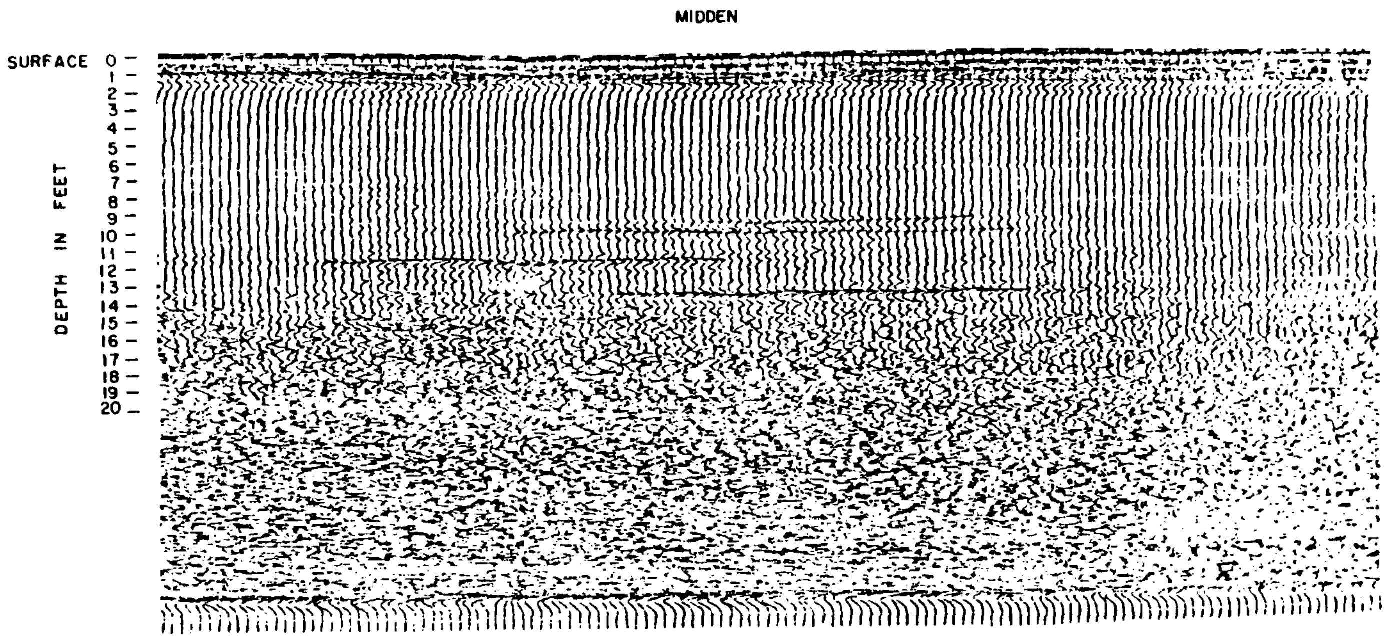

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FIGURE 18
ENHANCED RADAR WAVEFORMS FROM THE MIDDEN AREA AT McGREGOR LAKE, PARALLEL TO THE SHORELINE

from 6 to 9 feet. This interface may be the interface which is giving the strong signal between 5 and 6 feet as previously described. The core was abandoned at approximately 15.5 feet which indicates an absence of gravels to that depth. Therefore, the stronger signals at approximately 13 to 14 feet may represent a change in Holocene materials. Figure 18 depicts the enhanced radar chart.

The radar data taken parallel to the shore show more distinct interfaces in the location of midden. However, interfaces deeper than approximately 13 feet are not apparent. Again the radar data have been correlated to the boring taken at the McGregor Lake site. In general, the radar trace indicates fairly uniform conditions in the upper 10 feet with some small anomalies being present. The interface at 6 feet between silt and sandy silt does not appear as distinctly on the survey run parallel to the shore. However, the deeper anomalies (9 to 14 feet) appear much stronger. The suspected interface at a depth greater than 15 feet is not readily apparent on the radar charts. The enhanced radar chart is presented in Figure 19.

Lover's Lane Slough:

North-south radar survey lines were run across the midden located at the Lovers Lane Slough. the strength of the return signal and insufficient amplification of the wave within the recording system precluded magnetic recording of data at this site. The presence of the midden was not detectable on the radar strip chart. However, there is a strong return signal being reflected from an interface at approximately 7 feet. The depth investigated with the radar was reduced at this site since it was known that the midden was in the upper 5 feet of the subsurface. Since this strong interface seen at a depth of 7 feet is at the limit being investigated, it is difficult to interpret the extent or cause of this interface.

FTD (13 Am 210) - Yellow River:

Radar profiles were run at the FTD Site at the confluence of the Mississippi and Yellow Rivers. The field strip charts were employed as an adjunct to auger investigations and several anomalies were noted in the field. Because of inclement weather, difficulties were encountered with the electrical connections of the antennae and the data were deemed unreliable for analyses in the lab.

Remote sensing summary:

The great advantage of remote sensing techniques applied during this reconnaissance was the ability to conduct continuous subsurface sampling. Seismic refraction

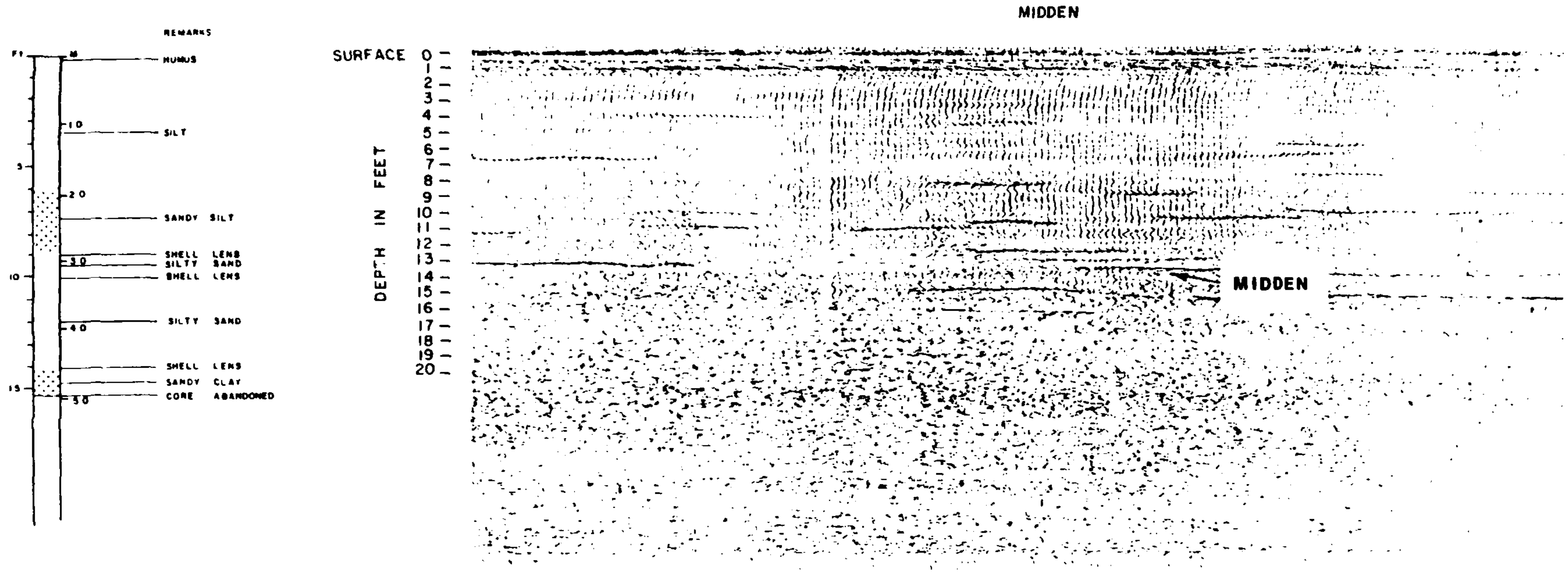

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FIGURE 19
ENHANCED RADAR WAVEFORMS FROM THE MIDDEN AREA AT McGREGOR LAKE, PERPENDICULAR TO THE SHORELINE

was extremely useful in determining the stratigraphic alluvial units in differing geomorphic contexts. Ground penetrating radar, while less useful as a survey technique, provided critical data on a site-specific basis. The major importance of these techniques, however, was the collection of data at depths below those accessible with hand tools. There is little question, particularly at McGregor Lake, that anomalies identified with the radar represent buried archaeological deposits. In other instances, the anomalies are likely the result of geologic inhomogeneities. Of course, as with all remote sensing techniques, it remains for these interpretations to be confirmed by sub-surface investigation.

Map Investigations:

The lowland floodplain is a dynamic environment. Certain changes in landform configuration during Holocene times have been demonstrated by archaeological investigations and analyses of recovered cultural materials (e.g. Theler 1983), soil coring and auger investigations, and remote sensing surveys. Recent changes in the landscape were documented by analyses of various historic base maps. Several specific topics were addressed through this exercise.
First, several previous surveys on the floodplain of the Upper Mississippi River had identified the destruction of archaeological sites by erosion as a major concern (Boszhardt and Overstreet 1982, Boszhardt 1982, Stoltman et al 1982, see also Gramman 1982). Unfortunately, there was little empirical data to document the extent of post-lock and dam landscape modification, and hence, the effect of the maintenance and operation of the 9-Foot Navigation Channel on cultural resources.

This gap was narrowed by utilization and comparison of the following historic maps: (1) the Mississippi River Commission charts compiled in the 1890's (scale of 1:20,000); (2) the W.N. Brown maps compiled for the War Department, Corps of Engineers, U.S. Army in 1931 (scale of 1:12,000); and (3) the Geomorphic base maps adapted from U.S.G.S. quadrangles developed by Church (1984) (scale 1:24,000). Scales were photographically corrected to a common scale of 1:24,000 and overlays were inked on drafting film to delineate landscape changes from the 1890's base. Few significant changes had occurred between the 1890's and 1930's. Thus, the areas of made and lost land are, for the most part, post-lock and dam phenomena.

One of the interesting sidelights of this map analysis was the confirmation of the statement by Church (1984) relating to the transitory nature of mid-channel islands. A review of Plates 8-11 will demonstrate that mid-channel islands mapped in 1893 are absent on current maps and

others, not noted in 1893, are now part of the landscape. One potential management application would be the disposal of dredge spoil on these post-1900 landforms.

Another important aspect of the map analysis is the confirmation of the fluctuation of side channels and the modification in the distribution of back-water lakes and ponds. Again, review of Plates 8-11 will serve to demonstrate the disappearance as well as the development of ponds and lakes. It is unlikely that there is any significant pattern to these changes. Rather, individual flood regimes are the likely candidates for fostering such change. The implications for understanding prehistoric settlement and subsistence patterns is important as active channel systems have already been demonstrated as significant resource procurement zones.

Theler, for example, in his analyses of fresh water mussels from Cr 186 and other mussel extraction and processing stations notes:

> I have no evidence to suggest anything other than relative stability of the principal channel(s) of the Mississippi River during the Woodland tradition. The floodplain in the vicinity of Prairie du Chien is marked, however, by an array of extant side channels and abandoned side channel traces with associated levee (lateral accretion ridges) systems that indicate a complex history of subordinate channel position and movement. I presume that these subordinate channels have, unlike the main channel(s), a restricted longevity. The initiation of an active side channel may have resulted from a particular event, such as a major flood event, breaching a prior, or existing system, resulting in a new or rejuvenated channel with low sinuousity and a high velocity current. In the Mississippi River floodplain of southwestern Wisconsin these new channels would have a sand and/or gravel substrate. These newly available habitats would be available for colonization by mussel species adapted to the particular substrate under a high energy current. I believe the optimal pioneer taxon would be the ebony shell mussel, whose host fish (the skipjack herring) necessary for dispersal of this species is adapted only to high energy, low turbidity aquatic systems. The early stages of colonization would find a dominance of one species and an associated low species diversity for other mussel taxa (1983: 266-267).

In addition, naiad analyses conducted by Theler demonstrate that aquatic regimes at various sites have shifted during the Woodland occupation of the sites (1983). This seems contrary to the generalizations presented by Church (1984) for sequential ridges, and thus sequential occupation. The author states:

> Lateral accretion deposits of minor channels are the oldest landforms still present on the Mississippi floodplain. The ridges of these deposits, not presently bordering water, represent former channel boundaries and may have been suitable locations at some time in the past for the seasonal exploitation of food supplies from the river. It is likely that late Archaic sites can be found on these ridges. Sites with younger affiliations will probably be restricted to ridges currently bordering water (1984: 34).

The fluctuations of side channels demonstrated for Woodland and historic times, as well as the occurrence of deeply buried sites adjacent to active channels, is difficult to reconcile with the correlations posited by Church (1984). Ridges of lateral accretion on island interiors are cited as locations of "older" archaeological deposits while those ridges of lateral accretion adjacent to contemporary shores harbor archaeological sites with "younger" cultural affiliations. This rejection of any age-depth relationship is a critical concept that needs to be tested by excavation. In essence, Church (1984, personal communication) argues that components buried by 10-15' of Holocene sediments at the shore of McGregor Lake (47 Cr 354) have less antiquity than a cultural shell midden buried by 3-4.3 feet of alluvium at Lover's Lane Slough just a short distance away. Confirmation of the sequential rates of formation of ridges of lateral accretion and the age-depth relationship of sites within these features could be tested by excavation of these two sites. Finally, in retrospect, we could have made more efficient use of the map data had we prepared the overlays prior to field investigations, and would urge that future investigators consider this compilation prior to crew deployment.

DATA SYNTHESES:

The results of the Stage I and Stage II sample reconnaissance surveys have yielded sufficient information to allow for predictive statements regarding both the distribution of Holocene landscapes and the distribution of archaeological sites on (in) those landscapes. Here, a cautionary note is warranted. The following generalizations or models are preliminary in scope. The predictions are based on data secured as a course of this investigation, rely heavily on

previous work, and are in essence a gross simplification of very complex and poorly known relationships and events. Finally, there will be very little acceptance of "predictions" unless and until these generalizations are subjected to more rigorous testing.

Distribution of Holocene Landscapes:

One of the questions to be addressed during this reconnaissance was the probability of site locations in relation to proximity of controlling factors such as terraces and tributary streams. Investigations of the terrace margins in Navigation Pool 10 provide insights relative to this question.

For example, the 12,000 B.P. topography of main terraces adjacent to the Mississippi River in Navigation Pool 10 has already been chronicled by Church and Smith (1982: 11-12). During the last downcutting episode associated with the drainage of glacial lakes Agissiz and Superior ca. 9,900-9,500 B.P. the most recent erosion resulted in the well known "fluted" surface. Church states:

> Glacial lake drainage caused downcutting into the alluvium deposited during the Woodfordian glacial substage. Several isolated patches of this material remain in the valley as terraces. The surfaces of some of these terraces (for example at Prairie du Chien and Bagley, Wisconsin) exhibit erosional features suggesting the occurrence of catastrophic floods. The gravels at an elevation of 560 ft 570 ft above sea level, or 50 to 60 ft below the present floodplain, are interpreted to be basal channel gravels associated with these catastrophic floods. The actual depth of scour during the high discharge events is uncertain. Much of the sand beneath the present floodplain may have been deposited upon recession of the last catastrophic flood and has since served as the foundation on which the present floodplain has formed. Additionally, some of the sand and silt has been introduced by tributary streams during the Holocene (1983:12).

Given the geological summaries, the site-specific archaeological information, and the coring/auger and remote sensing data, one can construct a model of the scoured terrace. In addition, the ubiquitous clay component of the so-called Late Wisconsinan Savanna terrace (Flock 1982) can be interpreted. Geologists and soils scientists have been aware of the occurrence of red and grey clay strata for many years and have suggested an approximate 9500 B.P. date of deposition (refer to Anderson's geomorphic summary of Pool 12 in

Boszhardt and Overstreet 1982). Flock has recently described the properties of red and grey clays from locations ranging from the Big Muddy River in southern Illinois to Lake Pepin in northwestern Wisconsin (1982). Further, he provides compelling arguments associating the clays with glacial lakes Agissiz, Grantsburg, and Superior. Finally, in support of Church (1984), Flock notes the regimes responsible for transporting these clays:

> The similarity in sediment textures between the Mississippi River localities and those several kilometers up tributaries suggest that the terrace sediment was not the result of normal overwash sedimentation. An enormous flood of clay-rich water into the upper Mississippi Valley appears to be the only feasible explanation for slack-water conditions extensive enough to form a clay-rich terrace for more than 100 km along the valley. Ice dams or other possible blockages seem to be unfeasible due to the extensive length of the terrace and the uninterupted slope of its surface (1982:173).

If one takes into consideration the post-Pleistocene topography of the Mississippi River terraces it is not difficult to envisualize the potential for ponding of clay-rich waters. Channel scars or "flutes" would represent ideal settling basins for the fine grained sediments whose origins were in the Agissiz, Grantsburg, and Superior glacial lakes. Possibly, levees could have formed at the mouths of these scour channels once the velocity of the floc ls had diminished. This would have had the effect of creating elongated ponds on the terraces trending, on the Prairie du Chien and Bagley terraces, in a northeast-southwest orientation. As Church has noted, scars are still present on contemporary topographic maps (1984). These slack-water environments would then result in the deposition of red and grey clays of predictable configuration on the eroded Woodfordian terraces. At the same time, the most elevated surfaces would not be the loci of deposition of fine grained sediments. Figure 20 presents an idealized profile of the Prairie du Chien terrace indicating the post glacial lake drainage topography (ca. 9,500 B.P.), the deposition of clays in old channel scars, and the Holocene alluvium which in part masks the earlier landscape.

The ramifications for the distribution of living surfaces is clear. Significant variation in relief, manifest in the seismic and radar profiles as well as in boring logs, would result in sites of the same age occupying different elevations within the Holocene sediments on the terrace remnants. The horizontal scale between 47 Cr 186 and 47 Cr 340 is not exact, however, the Figure (20) portrays a model of

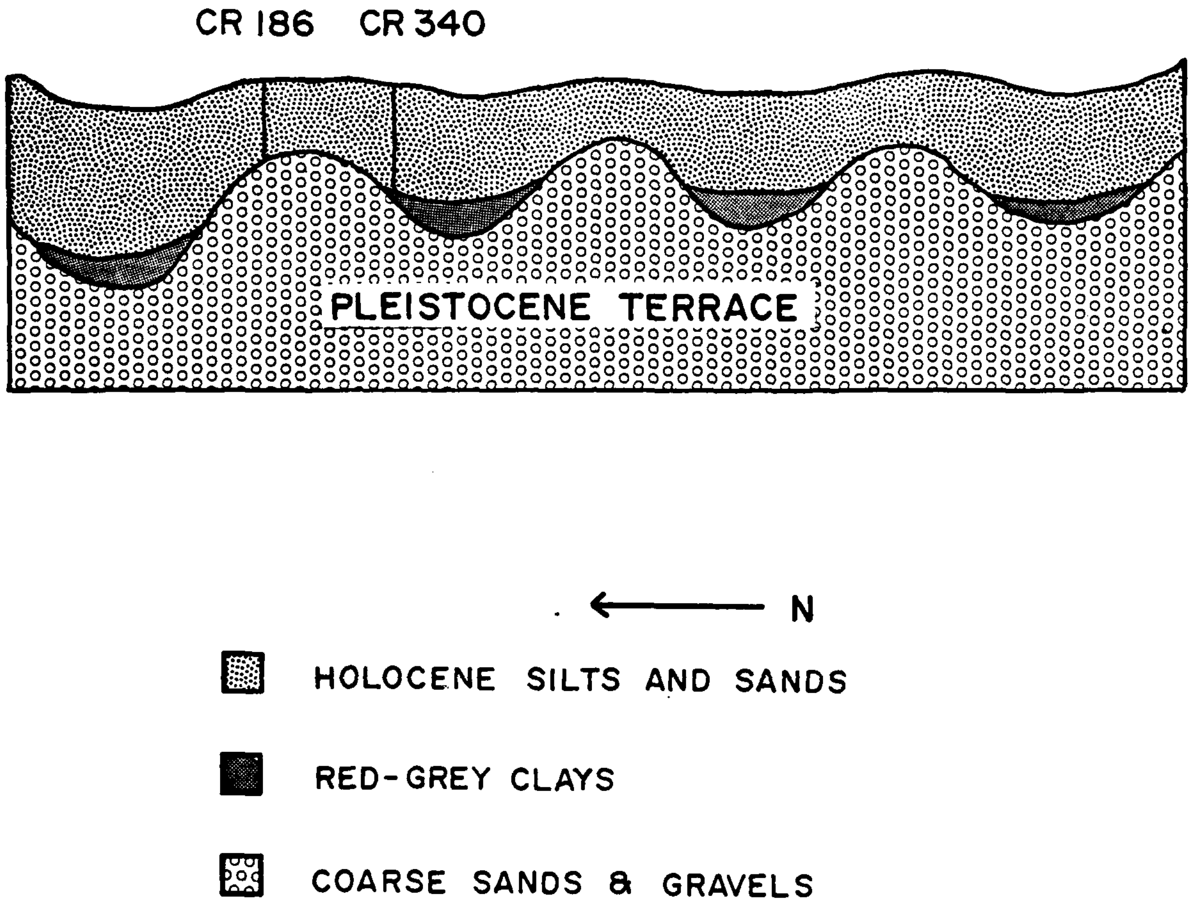

Figure 20: Stylized Profile of captured terrace at the Dillman Tract with relative locations of 47 Cr 186 and Cr 340.

how similar aged sites could occupy Holocene land surfaces at dramatically different elevations. The primary detraction of this model is that the archaeological deposits on the Dillman tract are not firmly dated.

If these assumptions are correct, sometime after the occupation of these land surfaces, the lowland floodplain of the Mississippi River in Navigation Pool 10 encroached upon the terrace margins. Holocene sediments were deposited atop the occupation surfaces, 47 Cr 340 being mantled prior to Late Holocene deposition at 47 Cr 186. Again, if these assumptions are correct, archaeological sites of similar or identical age can be expected on the terrace margins at different elevations that serve to reflect the post-Pleistocene topography of the terraces. In terms of geomorphic contexts, this means that once the floodplain, with its associated ridge and swale topography marked by ridges of lateral accretion, over-ran the terrace margin, sedimentary processes were no longer of the vertical accretion manner. It also infers that what may have been terrace settings for human habitation during the early Holocene are now floodplain localities. Figure 21 portrays the capture of the terrace margins on the Dillman tract. Are the occupation surfaces at 47 Cr 186 and Cr 340 of the same age? Only more extensive excavation will serve to empirically document both the geomorphological and chronological contexts to resolve this issue.

Holocene sediments are not as well understood on the main channel features of the Pool 10 floodplain. Whereas the entire Holocene sequence can be documented on the terrace edges, we cannot demonstrate the depth of Holocene sediments and associated fluvial processes for the islands adjacent to the main channel(s) of the Mississippi River in Navigation Pool 10. Church (1984) has already stated that scoured channels lie some 50 to 60 feet below the present floodplain. Our investigations have demonstrated that archaeological deposits lie 14-15 feet below the contemporary surface. However, we do not have at our disposal telling data that precisely define the depth of Holocene/Pleistocene interfaces in these sedimentary environments. We simply do not know how deep the Holocene alluvial fills are in the valley trench. Seismic refraction suggests a depth of 80 feet, a phenomenon that can be demonstrated by additional site-specific borings with mechanized equipment. At this juncture there is no question that such queries will not be ellucidated by the "status-quo" surveys so maligned by Bettis and Thompson (1981).

We can, however, predict, that near-surface survey will not detect the middle-Holocene sites now known to reside at depths of 15 or more feet below the surface and 10-12 feet below the water table. Further, the notions of Paleo-Indian

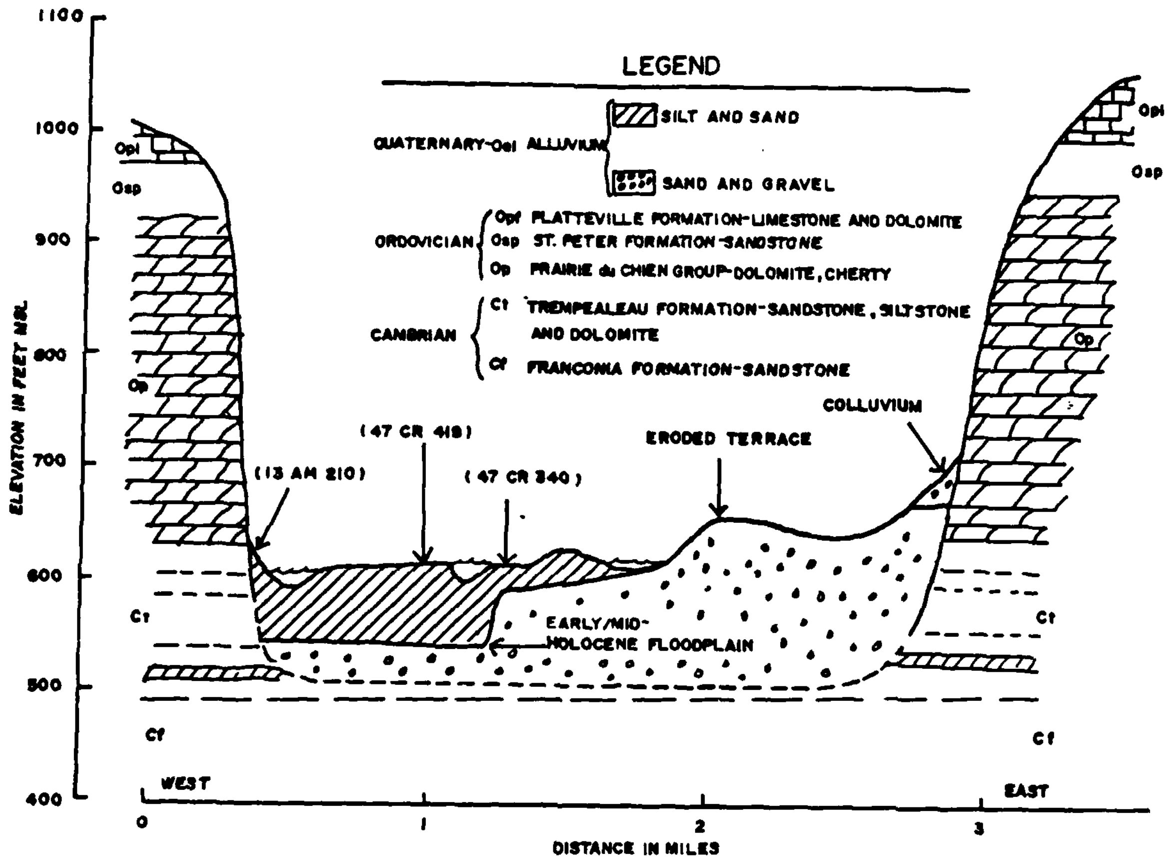

Figure 21: Stylized cross-section of the Valley at Prairie du Chien.

and Early to Middle Archaic occupation and utilization of the floodplain in the Upper Mississippi Valley are not based in fact. No investigations have been conducted on pre-300 B.C. land surfaces, save our cursory investigations at 47 Cr 340. Hence, all speculations, models, and theories of such utilization of the floodplain are equivocal. That such surfaces exists can no longer be seriously questioned. That such surfaces have been occupied by the region's prehistoric inhabitants has perhaps not been demonstrated to everyone's satisfaction. That the opportunity exists to provide sound empirical evidence of the entire record of Holocene culture history on the floodplain would be foolish to dispute.

This model of Holocene landscapes entailing approximately 3.0m of sediments on the terrace margins and perhaps as much as 15.0m on the main channel features has many limitations. While we can document, in one location, a full Holocene stratigraphic column on the Dillman tract, we cannot accurately date the buried surfaces between 9500 B.P. and 300 B.C. The fluvial stratigraphy of the main channel features is even less exact. Buried cultural horizons that pre-date 1000-3000 B.C. are known. The precise age of these horizons is not known. This preliminary construct of such landscapes represents a testable model and should serve as a useful guide to future investigations as well as future cultural resource management practices.

Correlations-Environment and Culture:

Certain cultural-environmental correlations for the late prehistoric period have already been presented (Theler 1983) and I find little to question regarding those data. It has been adequately demonstrated that Woodland populations inhabited the lowland floodplain of the Pool 10 locality to exploit the rich fresh water mussel beds. Theler has noted how underestimated the importance of this floodplain resource has been in the archaeological literature (1983). The occurrence of sites on ridges of lateral accretion for purposes of naiad extraction is demonstrated for Pool 10. Unfortunately, the relative age and stability of side channels is not understood. Presently, it appears that any elevation (ridge of lateral accretion) adjacent to an active side channel during Woodland times (300 B.C. A.D. 1400) would have been a productive environment. This model thus predicts that any contemporary ridge of lateral accretion on the lowland floodplain of the Mississippi River, to a depth of at least 1.10m, is the likely locus of a Woodland fresh water mussel extraction and processing camp.

Sites on terrace margins at a depth of 1.4-2.5m below the surface do not necessarily represent lowland floodplain occupation sites. Lithic debitage at several buried sites

analyses of shell midden sites in Navigation Pool 10 provides some data relating to fish procurement.

Theler has reported fish remains from Cr 310, 350, 186, 100, and 313 (1983). Exploitation of backwater sloughs and ponds for fish is demonstrated from identified species at several sites. However, Theler notes that fish were taken from both seasonally replenished backwater environments and active channel environments (1983: 214). It is difficult to assess the role of fish species in prehistoric dietary patterns of the floodplain inhabitants, even in the better known late prehistoric components. The emphasis of excavations to date has been upon shell middens. In these specialized contexts, fish remains, though limited in number, constitute a common element of the faunal assemblages. Until floodplain residential sites and short-term extraction camps related to fish procurement are excavated and the remains analyzed, it would be meaningless to attempt to determine the relative dietary importance of fish. It is quite likely that fish are under-represented in the published archaeological record. In part this may be due to the focus on shellfish midden sites where fish remains might be expected to occur in low frequencies.

In summary, site locations can be correlated with specific environmental settings. Shellfish beds occur along major channels and active side channels. Not surprisingly, shell midden sites are known to be associated with these channels. The correlations, particularly for side channels, are not as simple as the stated relationship suggests. Side channels in Navigation Pool 10 are subject to constant fluctuation. Thus, any abandoned side channel, for example, Lover's Lane Slough, was, while active, a potential location for the establishment of a shellfish extraction camp. Further, there is no apparent sequential relationship to these abandoned side channels and their life-span is unknown. Undoubtedly, their active status is dictated by the frequency and intensity of seasonal floods.

Similar correlations can be stated for fish procurement. As Theler's analyses note, fish remains are an expected element in main and side channel shell-middens. However, it is certain that non-naiad producing settings such as ponds and back-water lakes, were exploited for their concentrated fish resources, at least on a seasonal basis. It is important to state that this correlation is not based on substantial data in the Pool 10 locality. Much support can be drawn, however, from floodplain settings in other localities (e.g., Kelley 1979, Gregg 1975, Smith 1975).

Of additional concern regarding these cultural-environmental correlations is that they apply only to late prehistoric manifestations. The current understanding of the

floodplain during middle and early Holocene times is limited. Stoltman has suggested that the early floodplain was resource impoverished, and, during the pre-8,000 B.C. era the Upper Mississippi River was characterized by high gradients and cold waters which limited the range of fish and shellfish resources (1983: 204). There is a tremendous gap between this hypothetical environmental reconstruction and the patterns known to have been established by Early Woodland times. Until excavations can be conducted at some of the deeply buried components discovered during this reconnaissance cultural-environmental correlations are equivocal.

Seasonality and Scheduling:

Current models of late prehistoric resource exploitation patterns identify seasonal rounds with summer activities focused on the floodplain and fall-winter white-tailed deer harvests in surrounding uplands (Theler 1983: 275-279). For pre-Woodland times, Stoltman's synthesis of the Upper Mississippi Valley depicts these foragers as primarily upland-adapted hunters and fishers (1983: 207-216). Alternatives to these models are reasonable given the limitations of the archaeological record and our limited understanding of the probable sequence of floodplain development presented by Church (1984) and supplemented by these investigations. With regard to Theler's general model of Woodland subsistence patterns in the Driftless Area, the emphases are placed on the most effective scheduling to exploit shellfish beds. His arguments are compelling, but predictable, as the overwhelming focus of the floodplain excavations are directed toward shellfish beds. In the absence of significant excavated data from non-midden residential localities the potential for sampling error is high. It may ultimately be proven that more enduring occupation and utilization of the floodplain rather than the pattern of short-term summer extraction camps characterizes the Woodland traditions. Theler recognizes this possibility for regional Trempealeau Phase populations as he states:

> The flood plain-terrace position of habitation sites is perhaps suggestive of a strong riverine subsistence orientation. This phase, like the preceding one, may be characterized by small human populations. If this is the case, seasonal movement by family groups into the dissected uplands may not have been necessary to obtain a sufficient annual supply of deer meat and hides (1983: 277).

Why this strong riverine subsistence orientation could not apply throughout the Archaic periods, Early Woodland times, and even perhaps early Late Woodland escapes me. That such a pattern did exist on the floodplain may be borne out by further investigations at buried sites at McGregor Lake and

the Yellow River (FTD). Mallam has already cited the significance of confluence settings and seasonal patterns for locations such as the Yellow River. He notes, after establishing the distribution pattern of Effigy mound complexes and sites proximate to the Mississippi River:

> This distributional pattern is probably correlated with ecological variables. In other words, location of these mound complexes coincides with an environmental zone possessing a high density and variety of natural resources, the Mississippi trench.

With regard to the seasonal fluctuation of those resources Mallam indicates:

> While lush and verdant in the spring and early summer many of the marshes, lakes, and ponds became dried mud flats by the end of the summer period. The only areas capable of supporting high-yielding and annually renewable plant species were those zones where tributary waters confluenced with the Mississippi trench (1976: 53-55).

The intensive exploitation of fish and fresh water mussels demands no critical scheduling for resource procurement. Mussels could be harvested whenever water conditions permitted. Perhaps as Theler notes (1983) June-September were optimal collection times. If local conditions were favorable, there is no reason why shellfish could not have been collected prior to June and after September. Fish availability would have been high during much of the ice-free season. Granted, it may have been most efficient to harvest fish concentrations during spawning runs at tributaries or other localities and to collect "pond-trapped" species following periodic flooding. At the same time, an assortment of traps, weirs, nets, and lines could have been effectively applied during most of the ice-free season. Again, the demands of scheduling appear not to be as rigorous as those presented in various seasonal-round models. Yerkes (1981) analyses of fish scales from sites in eastern and southern Wisconsin demonstrate a pattern of fish procurement throughout most of the year. There are no reasons to assume a more restrictive pattern would apply on the Upper Mississippi River.

To me, Theler's alternative settlement-subsistence model for Trempealeau Phase and Prairie Phase sites has wider application:

> A near absence of data for upland winter occupations during the Prairie and Trempealeau phases

> are exceptions to this pattern. This may be related to a small human population not finding it necessary to venture very far into interior valleys of the dissected upland to supply winter subsistence needs. The winter habitation areas may have been located in close proximity to the Mississippi River flood plain during these phases (1983: 281).

In addition, his cautionary note regarding winter camps is significant:

> It is conceivable that the upland fall-winter components I describe in Chapter VII are not winter base camps. These upland sites could be the product of repeated, short term hunting and processing activities by family groups. Such groups using upland sites for short periods may have returned to large base camps situated on the flood plain-terraces of the major river valleys. While no large winter base camps are presently known in the major stream valleys of the Driftless Area, additional research is needed before the situation can be evaluated adequately (1983: 282).

Thus, it is possible that excavations at residential localities and deep site excavations could promote a rather distinct alternative to current suggested scheduling requirements for seasonal exploitation of lowland floodplain resources.

<u>Predictive Model</u>:

Church (1984: 52-53) has already established a model which correlates "archaeological potential" and Pool 10 landforms. This model is reviewed and Church's assessment of archaeological potential for specific landforms is evaluated based on data secured during the archaeological reconnaissance and from other sources.

I. Tributary Valleys

a. Tributary terrace surfaces: Based on the known distribution of archaeological sites Church notes these landforms as encompassing high archaeological potential and long-term stability indicating only minor surface erosion for nearly 10,000 years. As the reconnaissance was restricted to the lowland floodplain there is little we can add to Church's stated high archaeological potential for these landforms. As a cautionary note, however, such factors as deflation, loess mantles, extensive turbation, and the differential ages of the terraces themselves have created very complex sites.

Finally, site distributions in tributary valleys are poorly known in the reach of the Mississippi River that comprises Navigation Pool 10. Mill Coulee has a rather dense concentration of sites (Theler 1979), although this may not be representative of other tributary river, streams, and creeks. Finally, it is probable that cultural stratigraphy is best preserved in these environments under fans and aeolian deposits.

b. Tributary Floodplains: Known site distributions on (in) tributary floodplains are certainly biased. Deep site burial by accelerated deposition during historic times, linked to removal of vegetation from agriculture, is probably commonplace. In many confluent setting post-settlement alluvium can be measured in tens of feet and surficial techniques will be inadequate for locating archaeological sites in these geomorphic features. The deeply buried component at the FTD site at the confluence of the Yellow and Mississippi Rivers represents an example of this situation. High site potential at these settings is noted by Mallam (1976: 53-55) and Knox (1980, 1981), and, Knox and Johnson (1974) have discussed the nature of post-settlement alluvium.

Age-depth relationships of archaeological components in tributary floodplains will be complex. As Church notes:

> Tributary floodplains have experienced episodes of erosion, deposition, and intensified lateral channel migration during the Holocene leaving a complex mosaic of different aged surfaces on the tributary valley bottoms that differ little in elevation (1984: 52).

It follows then that: (1) archaeological sites will be difficult to define based on the depth of post-settlement alluvium and (2) that different aged surfaces at similar elevations will obfuscate age-depth relationships of sites encountered in tributary floodplains.

II. The Mississippi Valley

a. Alluvial fans: Old and intact surfaces are often found under alluvial fans, a phenomenon noted both by Henning (1982) and Church (1984). Emphases of depositional rather than erosional processes serve to explain this generalization. In spite of these factors, no systematic investigation of these contexts on the Mississippi terraces has been completed. Thus, the observation that such contexts may have "high archaeological potential" refers to the potential for encountering preserved Holocene contexts which is in fact high, and not to the frequency of archaeological sites which is in fact unknown.

b. Mississippi River terraces: Church states:

> Mississippi River terrace surfaces have a high potential of containing archaeological sites. These surfaces have been stable for nearly 10,000 years. The higher elevations on these surfaces have probably not been inundated by floodwaters for this length of time and therefore alluvial deposition and subsequent site burial has not occurred (1984: 52-53).

The substantial number of recorded archaeological sites on terraces adjacent to the Mississippi River (Overstreet, Mason, and Fay (1983) supports, and probably is the basis for, Church's generalization. However, while the potential for encountering cultural remains is high, the potential for encountering intact deposits may in fact be quite low. The stability of Mississippi terraces throughout the Holocene is questionable. In many localities surfaces have been severely deflated and much of the stratigraphic record of the Holocene has been lost. A clear cut example of such deflation and removal of stratigraphy is known for the Hog Hollow Site (Geier 1976). Oftentimes dune-like formations or wind-blown sediments have covered the deflated surfaces to significant depths. Thus, in spite of the conditions of site burial, good stratigraphic contexts are likely rare rather than commonplace on Mississippi terraces. Prominent features such as mounds are abundant and these may cap intact stratigraphy. Holocene climatic shifts have had a significant impact on the topography of Mississippi River terraces. Specifically, we can correlate erosion (deflation) of these surfaces with warm-dry episodes during the middle to late Holocene during which time vegetation was removed from the droughty soils of the terraces. During this erosional episode coarse materials such as gravels, Macroscopic observation of such stratigraphy will not reveal the distinction between undisturbed matrix and aeolian deposited sands, however, this distinction can be readily made with low power magnification. In conclusion, I agree with Church that the terraces were intensively occupied and artifacts are abundant. At the same time, archaeological deposits in the terrace matrix will often be found to have been severely disturbed.

c. Mississippi River terrace outliers: These landforms have been identified at the Prairie du Chien terrace and very likely exist at Harper's Ferry, and other locations (Church 1984). Test excavations at 47 Cr 340 provided sufficient data so that one can predict, at least for late Holocene times (post-Late Archaic) cultural stratigraphy can be found in undisturbed context. Church correctly and succinctly notes that a significant portion of

the Holocene record may be reserved in the fine-grained sediment capping these outliers (1984: 53). Of additional utility is the proposition that scoured areas or other depressions on these terrace outliers may be expected to contain red and grey clays providing a field marker no later than 9,000 B.P. This of course assumes that these clay deposits are not reworked clays from local upland contexts and have been deposited subsequent to glacial lake drainage.

It is important to note that the earlier cultural materials on these terrace outliers, that is to say, those which pre-date encroachment of the floodplain on the terrace margins, may have limited interpretive value. For example, the most deeply buried component at 47 Cr 340, a dense concentration of lithic debris lacking any diagnostic artifacts, may rest upon a deflated surface. While Church (1984: 32, 38) interprets the contact between the gravel and the overlying fine-grained materials as an erosional unconformity related to late Woodfordian and early Holocene entrenchment of the Mississippi River, alternative explanations should be considered. If Church's assumptions are correct, aggradation of the floodplain and capture of the terrace margin would have occurred early in the Holocene. It is also possible that the lithic debris, 7 feet below the present surface represents a Late Archaic occupation which rests on a deflated middle Holocene surface. If this latter interpretation is correct, aggradation of the floodplain to the level of the terrace margin would post-date Late Archaic times, middle to late Holocene in age.

Thus, while we can predict that terrace outliers harbor stratigraphically separated late Holocene components, the case for early and middle Holocene occupations in the silty matrix is equivocal. Firm dating, probably on typological grounds, is needed for the early component at 47 Cr 340 and/or other locations on terrace outliers before confident predictions can be made for pre-Late Archaic surfaces.

d. Islands underlain by lateral accretion deposits: Cultural deposits can be expected to occur at depths of 15 or more feet below the present surface adjacent to active shorelines. Because of the sequential formation of ridges of lateral accretion, Church (1984) has indicated that these areas of high archaeological potential require carful interpretation. He notes: "Buried sandy ridges under the island interiors are older than those along the island perimeters and some may represent middle to possibly early Holocene landforms" (1984: 53). The McGregor Lake locality, where stratified cultural deposits are known to occur 15' below the surface, perhaps exhibits this age-depth relationship. Dating of these components adjacent to the current lakeshore and a known component on an island

interior ridge of lateral accretion would serve to clarify the chronology of sequential formation of the ridges and the age-depth relationship of archaeological sites in such settings.

The 15 foot depth merely represents the most deeply buried component known for the Pool 10 floodplain. Given that more than 40 feet of Holocene alluvium has been identified at various localities on the valley floor, archaeological sites can be expected to occur below the 15 foot depth.

e. Areas mapped as vertical accretion deposits: Aside from vertical accretion deposits atop terrace outliers, and at the confluence of the Yellow and Mississippi Rivers, no archaeological sites have been found in association with these geomorphic features. Backwater lakes and ponds contain abundant floral and faunal resources, yet specific site data are lacking. One possible reason is that these poorly drained and often inundated localities lack erosional features and cultural materials are not present on the surface. Sub-surface investigations will have to be conducted in vertical accretion deposits before the archaeological potential can be accurately assessed.

f. Braided stream deposits and mid-channel islands south of the mouth of The Wisconsin River: Reconnaissance survey failed to locate archaeological sites on these landforms. Historic maps and geomorphic investigations demonstrate the transitory nature of many of these landforms. In addition, their flat topography results in their frequent submergence, even during minor floods. Church has suggested that these features are subjected to active reworking, and all but the most recent sites would have been removed (1984: 53). Although archaeological sites may occur infrequently on and in these landforms, discovery and dating of cultural components would be of use in dating the landforms themselves and in determining the rates of reworking by natural processes. Both variables are currently unknown.

This predictive model cannot be misconstrued as comprehensive. Verbal-descriptive by necessity, the model is limited by obvious imprecise knowledge of both the distribution and aerial extent of past landscapes now buried by recent Holocene alluvium. Its purpose here is to reasonably predict where archaeological deposits can be expected to occur within the three dimensional matrix of the Mississippi River floodplain of Navigation Pool 10. Until such time as we have a better understanding of the evolution of the floodplain and associated changes of available resources, we can only speculate about how prehistoric

landuse patterns were adjusted in response to shifts in climate and biota. The first approximations of site locations presented in relation to Church's geomorphic units (1984) represent only a minor step in documenting aboriginal land use on the floodplain of Navigation Pool 10.

CONCLUSIONS AND RECOMMENDATIONS:

Study Summary:

This archaeological reconnaissance survey has accomplished most of the major goals established for the study. First, a research design was developed to accommodate the requirements of a unique environment. Deep sampling strategies are difficult under optimal conditions. Conducting such work on the lowland floodplain of the Mississippi River where problems of water travel, inundated landscapes, and an extremely complex geomorphic system is in operation is quite challenging. Among the most positive aspects of the study is the development of successful techniques to implement research designs on the floodplain. This included the integration of traditional archaeological investigative methods, soil coring and augering with hand tools, and remote sensing to address both geomorphic and archaeological problems. Identifying several deeply buried components in the Holocene sediments of the Navigation Pool was quite gratifying. Many archaeologists have suspected that buried archaeological components existed in the floodplain sediments, however, prior to this reconnaissance, no such components had been identified. Finally, the preliminary model of Holocene landscapes is not as comprehensive as we would prefer. Nontheless, we can now make plausible predictions about the depth of landscapes in many geomorphic settings on the floodplain. These positive aspects notwithstanding, significant limitations hinder the utility of the results of investigations.

Study Limitations:

As the body of the report demonstrates, two major geomorphic contexts can be identified within the contemporary Pool 10 floodplain. These are the captured terrace margins, and the main channel environments. A lack of the specific dating of the buried land surfaces is a major limitation. The Dillman tract, for example, represents a location where we have been able to date surfaces that span the entire Holocene. This does not imply that the column depicts the entire range of Holocene sediments. At some unknown time, perhaps as recently as 3,000-1,000 B.C., the floodplain aggraded to a point where it over-ran the terrace margin. This cannot be established until the hiatus can be fixed within temporal limits. Excavation at the Dillman

tract would accomplish this task and resolve a major limitation by clarifying rates of floodplain aggradation.

A second limitation is that we have uncertainties relating to the depth of Holocene sediments adjacent to major channel features. A safe estimate is that there are more than 50 feet of such sediments, incorporating buried archaeological deposits in the main trench. How old are the identified living surfaces at McGregor Lake, Lover's Lane Slough, and the FTD Site? We simply cannot say. There is no doubt that these buried sites are earlier than Late Archaic (3,000-1,000 B.C.). It is clear that this major problem cannot be clarified without excavation at one of these locations adjacent to a main channel environment. The opportunity to date such buried surfaces would provide critical data with regard to the aggradation rates of the floodplain as well as the early-mid Holocene occupation and utilization of the river by prehistoric inhabitants.

Remote sensing has yielded data that could not have been collected through any other means. Continuous sampling of buried surfaces adds a new dimension to landform evolution studies. Unfortunately, we could not verify many of the interfaces and anomalies because they were identified at depths beyond hand-tool capabilities. As with all remote techniques, skepticism, and rightfully so, will remain until field verification can be realized. The confirmation of near surface features (within 15 feet of the surface) identified by remote techniques should do much to enhance the credibility of such techniques.

The last major limitation is that in spite of the substantial number of archaeological investigations that have been conducted in the Pool 10 floodplain locality, the archaeological record has tremendous gaps. Only a few thousand of the last 10 thousand years are well documented in the excavation records in floodplain contexts. The tantalizing yet equivocal Agate Basin projectile point recovered by Al Reed suggests that the floodplain may harbor very old land surfaces indeed. Are 9,000 year old, intact, occupied surfaces present in the alluvial valley fill? These reconnaissance investigations would support an affirmative response to such a query. Deep excavation would perhaps confirm it.

Taken together, these limitations serve as an explanation why the predictability of the model is so limited. It has only been demonstrated where buried archaeological sites may be found in the alluvial fill. Currently, there is insufficient information to predict site size, configuration, cultural affiliation, and function of the buried components. Owing to these limitations, it is understandable that I am reluctant to attempt more specific generalizations.

Implications for interpretations of previous and future studies:

Based on the results of these reconnaissance investigations it seems clear that previous inventory work, while perhaps adequate for immediate impact considerations, does not provide comparable data. There are, for example, no references to known or suspected early or middle Holocene occupations on the floodplain of the Upper Mississippi Valley (Overstreet, Fay, and Mason 1983). Substantial numbers of acres have been subjected to cultural resource surveys related to dredge disposal projects, flood protection, and navigation related undertakings. None of these reports documents consideration of deep testing, potential existence of occupied buried surfaces, or provides information relative to age and depths of Holocene sediments. Consequently, the results of these investigations may be considered incomplete.

Future inventory studies of cultural resources should consider provisions for deep testing if the results are to have any value to the problems at hand. In addition, it is imperative to consider the geomorphic contexts within which the studies are being conducted. We were fortunate to have the assistance of Peter Church and James Knox in the field to verify, and often correct, our assumptions. I would hope that we were able to provide them with useful information during the course of the study. In any event, the benefit of integrated archaeological-geomorphological research seems apparent for future work on the lowland floodplain.

A last implication relates to the logistical problems of archaeological survey and testing on the floodplain. The costs of such investigations are high when compared to those implemented in terrace and upland settings. The inaccessible nature of most of the floodplain is a major problem. Access can only be attained by boat. This in turn, limits the size and weight of equipment that can be transported to site locations. Further, water craft travel is time consuming and expensive.

Fluctuations in pool levels frequently impact field schedules. It is not unusual to have completed a partial collection of an exposed site on a foreshore and arrive the next day only to find the site inundated. Dewatering of excavation units is another major problem. Small excavation units can be dewatered by a sump and hand-pump technique. Correspondingly, the larger the excavation unit, the larger the volume of seepage. Mechanized units would have to be utilized for block excavations. In addition, given that archaeological sites will be encountered below depths of 15 feet, attention must be directed to such safety factors as

shoring of exposed walls. Finally, heavy, often noxious vegetation such as poison ivy and nettles as well as pools of standing water make it very difficult to traverse island interiors. In conjunction, these factors make survey and testing procedures on the floodplain substantially more costly than in terrace or upland settings.

Implications for Management Policies and Procedures:

The late prehistoric and historic archaeological data base is being severely impacted by erosion directly related to maintenance and operation of the 9 foot navigation channel. At the same time, numerous sites of early to middle Holocene times are preserved in the alluvial silts and sands of the floodplain. It is heartening to report that the deeply buried sites are not likely to be impacted by any construction activities save those that would entail relatively deep earth moving.

Sites of Late Archaic to Historic affiliation are being destroyed at an alarming rate. This can be minimized to some extent by practices which have already been implemented. Protection of eroding shorelines where archaeological sites determined eligible for the National Register are being destroyed is a possible partial solution to this problem. Disposal of dredge spoil or other construction activities could be sited at post-1900 landforms. In addition, emergency recovery programs should be implemented at eligible sites. Shoreline erosion could be reduced by lowering and stabilizing water levels in the Navigation Pool. No doubt countless other alternatives could be considered. In spite of extensive study and documentation of site destruction, impacts continue unabated (see for example Gramman 1982). The extant survey data are biased reflecting areas of active erosion. In addition, virtually all of the sites identified from cut-bank situations can be associated with Woodland era occupations. We cannot ascertain at this time if these eroding sites represent a limited segment of the variation within the total site sample on (in) the floodplain. If, in fact, the sites do represent a limited segment of the variation, then their loss is more serious than stated. If not, the loss is less serious than stated. In either case, a strategy is needed for selecting significant sites for further evaluation.

The magnitude of the problem is huge and the resources limited. If meaningful and consistent progress is to be made to mitigate site destruction, a memorandum of agreement, following consultation with State Historic Preservation Officers and other interest groups must be implemented. Difficult decisions will have to be made. All of the eroding sites cannot be saved, but, close

coordination with all interested and responsible agencies is viewed as the only effective mechanism to lessen the impact of incessant site destruction. This would be a preferred and significantly improved management approach when compared to site-specific construction-related cultural resource surveys of the past several years. Many of the dollars expended on compliance surveys have yielded little significant information when contrasted with those spent on managed topical research and cultural resource management should be re-evaluated from the perspective of information yields. Programmed research, on a pool by pool or other geographic basis, will be less expensive, more effective, and more consistent with the over-all goals of anthropology and the legislative framework of Historic Preservation.

Recommendations for Modification of Resource Management:

Management of cultural resources on the lowland floodplain of the Mississippi River in Navigation Pool 10, as well as in other navigation pools is faced with many problems. First, as attested to in this report and many others, the recent prehistoric and historic archaeological data base is being subjected to significant impacts related to management and operation of the 9 foot Navigation Channel. As a response to this impact, and in response to possible adverse effects from various flood protection and other construction projects, the St. Paul District Corps of Engineers has sought to fulfill its responsibilities to the identification and protection of cultural resources through investigations on site-specific bases. Individual identification and evaluation projects have not been effective for a number of reasons, particularly in floodplain contexts. First, the logistical problems have limited survey and testing operations. Second, the geomorphic contexts on (in) which archaeological sites occur have not been readily identified. Third, many of the small, isolated, localities in which various undertakings occur have not been integrated within a more manageable study unit, such as a navigation pool. These individual project surveys, in my opinion are not really cost-effective, nor, have they yielded information that would improve management capabilities. It is true, that in some instances archaeological sites have been identified and tested, but to this point they have been evaluated only in terms of their own unique features.

Two changes in approach to cultural resources management are suggested to improve the identification and preservation of significant sites, these obligations representing the major responsibilities of the St. Paul District. First, emphases should be placed on management units rather than on site-specific bases. Without question,

this is likely going to result in the destruction of some archaeological sites of unknown significance. However, to continue to invest resources on a project by project, impact by impact basis will not improve management of significant historic and prehistoric sites and properties. The philosophy that at some point in time, given continued inventory and evaluation work on a project by project basis, sufficient information will be available to implement sound management practices is, in my opinion, faulty. Programmed or planned inventory and evaluations will, in a shorter time frame and at less cost, achieve the desired end of more effective protection measures for significant cultural resources.

This departure from current practices, if implemented, will require consultation with other agencies, e.g., respective State Historic Preservation Officers, State Archaeologists, and the U.S. Fish and Wildlife Service. Mechanisms already exist to implement such a program. Thus, it is recommended that the St. Paul District, U.S. Army Corps of Engineers continue communications with the cited agencies to work toward a Memorandum of Agreement that will address a program of reasonable and effective mitigation of adverse effects due to erosion. At the same time, consideration could be given to RP3 study units as an aid to evaluation of sites in a broader context. Wisconsin and Iowa have already identified study units for the RP3 process, however, the studies are available only in draft form.

The second suggested modification in approach relates to the development of geomorphic models, again on a pool by pool basis. Until the major geomorphic features and contexts of the lowland floodplain have been identified, archaeological survey cannot be effective. It is likely that inventory investigations will only be conducted on very recent landscapes. The preliminary work of Church (1984) and consultations in the field with Mr. Church were critical elements of the Pool 10 reconnaissance. The discovery and interpretation of deeply buried archaeological sites would not have been likely without the baseline geomorphic study and the field consultations with Mr. Church. It is not considered cost-effective to implement geomorphic studies on a site by site basis. Ostensibly, sufficient information could be compiled over a long period of time, however, the quality of each inventory would be hindered by the lack of the geomorphic baseline study. Finally, it should be restated that these recommendations apply only to the unique environment of the lowland floodplain. The main and tributary terraces and uplands do not require the same kinds of methods and techniques necessary to identify and evaluate archaeological sites situated in the complex geomorphic environment of the lowland floodplain. This does not mean to suggest that alluvial landscapes and terrace systems of

tributaries, or for that matter, all alluvial contexts are less complex and challenging in a sampling sense. Rather, the intent is to draw special attention to the deep water logged alluvium of the Mississippi basin that presents technical problems in the extreme. Erosion, slow deposition and turbation have created complex sites whose components must be sorted out via the meticulous study of sediment deposition and pedogenesis. The efforts here have only addressed the major problem of statistically reliable samples in deep alluvial environments. A variety of methods and techniques that could be used to secure a reliable sample have been explored and evaluated. It should be clear that we have failed to secure such a sample. Further, until such time as the habitable three dimensional volume of the floodplain is known, a reliable sample cannot be attained. Finally, it should be apparent that even if the cultural matrix volume was known, the time and resources necessary to obtain a stratified random sample based on geomorphic strata would be prohibitive. Predictions then can only be stated in terms of the current understanding of the Holocene sediment record supplemented by the few known deeply buried cultural components within that record.

Evaluation of Survey Methods and Techniques:

Utilization of non-traditional techniques were evaluated prior to conducting reconnaissance field-work. Some techniques such as back-hoe trenching and mechanized coring were rejected. These techniques are very difficult to apply on the floodplain. First, most all of the survey environments have to be reached by boat. Under the limitations of the contract, sufficient funds were not available to transport mechanized equipment from location to location by barge or other means. Even if such transportation were available, back-hoe trenching for example would not have provided the data we sought during the reconnaissance. Such power excavating equipment is not capable of excavation beyond 10-12 feet below the surface. Power augers certainly would have been more effective than the hand tools utilized during the reconnaissance, however, the costs of transporting such equipment from the mainland to the islands was simply not feasible. As a result, our emphases were placed on hand tools and portable remote sensing equipment and each are given more critical appraisal in the subsequent discussion.

Hand Tool Techniques:

As previously noted, Oakfield tools and "Iwan" type augers were used for coring operations. Their major limitation has already been noted. They cannot be effectively used beyond depths of approximately 15 feet below the surface. The major benefit of hand tools is their

relatively low cost and high portability. Such tools have been proven effective for the discovery of buried archaeological sites at depths of 15 feet. However, another limitation is reflected in the size of the matrix samples from such tools. A one-inch or three-inch core is sufficient to determine the presence or absence of occupied land surfaces. however, hand tools such as an Oakfield tool or auger will not normally provide information useful for dating the land surface. In addition, the requisite information normally relied upon by archaeologists to infer site function, type, cultural affiliation, and other data necessary to evaluate a given site will not be secured through the use of such techniques.

In addition to hand coring tools, hand operated pumps, and the usual shovels, trowels, and screens were employed to obtain a larger sample from a buried site. This exercise was conducted as much to obtain a larger sample of cultural materials and clarify geomorphic data as it was to identify problems of excavation on the floodplain. As noted in an earlier discussion, we were able to control a $50cm^2$ block. Dewatering was accomplished by establishment of a sump and siphon pumps. Without major logistical support, it is not feasible to conduct block excavations on the floodplain at deeply buried sites. If such excavations are to be successful, mechanized dewatering systems such as well points or pumps powered by gas engines will have to be utilized. As well, our excavations were conducted to a rather shallow depth of 3.0m. To investigate components buried as deeply as 15 feet, some protective shoring would be necessary for the protection of the excavation crew.

In conclusion, inexpensive portable equipment can effectively be applied to investigate buried sites within 15' of the existing surface. Coring and auger tools can provide the same information as mechanized tools within recognizable limits. Hand excavation of near-surface phenomena, that is to say, within about 6-9 feet of the surface can be conducted without mechanized equipment or significant logistical support. The quality of the excavation suffers, however, dependent on local rates of water seepage, the structure of the matrix, and the nature of the archaeological deposit. Hand tool investigations should be limited to the identification of buried archaeological deposits. The methods and techniques described herein are not adequate to determine the National Register eligibility of deeply buried components.

Evaluation of Remote Sensing Techniques:

Remote sensing techniques are not new to archaeological investigations. Their most profound applications, based on literature review, have been related to the location of

buried architectural features such as walls, foundations, or collapsed structures. Few attempts have been made to apply remote sensing techniques to geomorphological investigations or as archaeological site survey tools. One of the most often expressed criticisms has been in regard to costs. During the course of this reconnaissance, remote sensing was not only cost effective, it was the only method of conducting continuous sub-surface sampling.

Perhaps the excavation of back-hoe trenches could have provided continuous profiles to interpret near-surface geomorphic features. Such methods, however, would not have been effective to depths of 60-80 feet that were easily within the realm of seismic refraction. Ground penetrating radar allowed us to infer features of sub-surface topography without destruction of vegetation, soils, or buried archaeological deposits. In addition, the portability of remote sensing equipment allowed us to more rapidly sample a series of locations, a feature that would have been prohibited with mechanized equipment.

As with any remote sensing technique, a major limitation can be identified in that the data generated are derived from theoretical geophysics. The results of ground penetrating radar represent changes in dielectric properties in the matrix being sampled. With seismic refraction, velocities of shock waves are being measured. Together, the geomorphologists and archaeologists must interpret what these anomalies represent. Objective interpretations, in turn, rely on confirmation of anomalies either through coring or excavation. Currently, and based on these reconnaissance investigations, remote sensing is viewed as an important adjunct to traditional survey techniques. In no sense are the remote techniques and others that might be applied replacements for archaeological and geomorphological investigations. The primary function of such techniques can be described as a powerful interpretive device, one that makes reconnaissance or intensive survey much more effective by providing data that can be secured by no other means. When compared with other techniques, particularly the use of mechanized excavating equipment, the information yield in relation to costs makes remote sensing techniques highly cost-effective.

Recommendations for Additional Investigations:

Reconnaissance investigations are, by definition, designed to provide a general assessment or impression of a locality's historic and prehistoric sites. There is also an intent to predict where certain types or kinds of sites are likely to occur. Consistent with reconnaissance goals, as stated in 36 CFR 64, such preliminary investigations should,

if they have been successful, provide for more informed and efficient intensive surveys during later planning stages. In this respect, the archaeological reconnaissance investigations at Navigation Pool 10 have been successful. Unfortunately, there have been notable failures. We have not been able to fully answer some of the important questions raised in the Scope of Work (see Appendix A). For example, it is not possible to provide much information that would clarify the size, density, depth, and extent of deeply buried sites. There are insufficient data at this juncture to soundly estimate the total number of sites within the Holocene silts and sands of the floodplain. Given the geomorphic reconstruction of the floodplain literally hundreds of potentially occupied surfaces lie intact within the post-Pleistocene sediments. Cultural affiliations are woefully inadequate for pre-300 B.C. manifestations. Finally, the generalizations regarding the depth and distribution of buried landscapes are not as refined as we would prefer and, hence, we must provide only gross statements relative to the occurrence of archaeological sites to be found on these surfaces. The following specific recommendations focus on improving the utility of the predictive model of Holocene landscapes and associated archaeological sites and the techniques to acquire the necessary data.

<u>Future Survey Investigations</u>:

Future survey investigations in Navigation Pool 10 should focus on the identification of geomorphic contexts in which sites occur. This of course will entail deep coring, remote sensing, or other methods that will allow for evaluation of Holocene sediments. Shallow investigations may be adequate for specific potential impact localities, i.e., dredge disposal sites. Where extensive excavations are contemplated, i.e., barge terminal construction, precautions must be taken to ensure that the depth of intensive survey investigations are well beneath the excavated areas. If the actual distribution of buried archaeological sites is ever to be determined, then the entire Holocene alluvial sequence must be adequately sampled.

<u>Gaps in the Archaeological Data Base</u>:

At this stage of investigation substantial gaps in the archaeological record can be identified. First, while we know that components that pre-date 300 B.C. can be found at depths of 7-15 feet below the current surface, we do not precisely understand the full range of buried sites. Further, those we have identified cannot now be accurately dated nor can specific cultural affiliations be stated. Future investigations should focus both on the establishment of absolute chronologies as well as the identification of cultural affiliation of buried components. While there are

several immediate needs to be resolved, the "purpose of human presence on the flood plain through time" (noted by Church 1984: 48) is one of the essential reasons for interest in human use of that habitat. This entails refinement of current cultural models. The geomorphic record is one tool to find and understand the record of such use and in part to explain it. Integration of the geomorphic phenomena and cultural behavior revealed in the archaeological record provides a comprehensive approach better suited to fill gaps in the data base.

Gaps in the Geomorphological Data Base:

Church (1984: 39) has already noted that the refinement of the relative and absolute chronologies of landforms on the floodplain would be of paramount interest to archaeologists and geomorphologists. In addition, although these investigations have partially resolved this question, they note the need to determine the nature of Early Holocene floodplain formation and the presence of Early Holocene surfaces (Church 1984: 39). Finally, the determination of sedimentation rates from varying geomorphic contexts is a major concern.

Tangential and secondary needs to refine the Navigation Pool 10 geomorphology are many and varied. The pedogenic development at a significant number of localities on the floodplain remains unknown. The parameters of Holocene deposition on the terrace margins is not known. When did the floodplain agrade to a point where vertical accretion deposits began to cover the Pleistocene topography? To answer this question will provide a means to relatively date all of the archaeological sites within this Holocene matrix. Archaeological sites in these geomorphic contexts can be no older than the time, probably quite late in the Holocene, when the floodplain began to capture the terraces. Precisely how deep are the Holocene sediments adjacent to main channel features? These concerns, if resolved will greatly enhance the utility of a predictive model of Holocene floodplain evolution.

Immediate Needs to Resolve Major Deficiencies:

In order to provide data necessary to resolve the major gaps in both the archaeological and geomorphic records, more detailed investigations must be conducted at multi-component sites on the terrace margins and at main channel localities. Deep excavations on the floodplain environment would be extremely challenging, but are in fact feasible. Such investigations should be guided by an explicit research design which would identify the major questions to be addressed as well as the technical problems anticipated.

This approach appears to be the most effective means of securing the following information: (1) relative and absolute chronologies of buried landscapes and buried archaeological components; (2) detailed sedimentologic and stratigraphic descriptions of Holocene alluvium in the two major geomorphic units; (3) the nature of the Early Holocene floodplain formation, and the identification of Early Holocene surfaces; and (4) confirmation or rejection of the hypothesized cultural hiatus from 8000 BP to 5000 BP on the floodplain. Of additional concern is the potential applicability of reconnaissance archaeological survey and geomorphic investigations in Navigation Pool 10 to other localities in the Upper Mississippi River Valley. In order to determine applicability to a larger reach of the Mississippi river the more detailed investigations in Navigation Pool 10 should be conducted. Appropriate localities for deep excavations have been determined by these reconnaissance efforts and it is recommended that additional work be conducted at the Dillman Tract and McGregor Lake localities.

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APPENDIX A

Scope of Work

APPENDIX "A"
Scope of Work
Archaeological Reconnaissance Survey of Pool 10,
Upper Mississippi River, Grant and Crawford Counties,
Wisconsin, and Allamakee and Clayton Counties, Iowa

1.00 INTRODUCTION

1.01 The contractor will undertake a reconnaissance survey of cultural resources within Pool 10 of the Upper Mississippi River Basin. This study is being undertaken as part of the St. Paul District's Operation and Maintenance Program for the 9-foot Navigation Channel on the Upper Mississippi River.

1.02 The cultural resources investigation shall focus on the study area as described in paragraph 3.01 of this Appendix A. The study shall consist of the following tasks:

(1) Development of a research design to include the design of a probability sample.

(2) Reconnaissance survey based on sampling design.

(3) Development of a predictive model for site location.

(4) Preparation of a detailed technical report.

1.03 The objective of the reconnaissance survey will be the development of a predictive model which can be used by the St. Paul District in performing planning, regulatory, operation and maintenance functions within Pool 10. The model developed by the Contractor will be used to determine the needs for further survey, the adequacy of future survey methods and techniques and the impacts on resources from a variety of actions.

1.04 The cultural resources investigation reports serve several functions. The technical report is a planning tool which aids in the preservation and protection of our cultural heritage. It is also a comprehensive, scholarly document that not only fulfills federally-mandated legal requirements but also serves as a scientific reference for future professional studies. As such, the report's contents should be both descriptive and analytic in nature.

1.05 The investigation and reports represent partial fulfillment of the obligations of the St. Paul District toward cultural resources as required by the National Environmental Policy Act of 1969 (P.L. 91-190); National Historic Preservation Act of 1966 (P.L. 89-665) as amended; Protection and Enhancement of the Cultural Environment (EO 11593); Advisory Council's Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800); Preservation of Historic and Archaeological Data 1974 (P.L. 93-291); and Corps of Engineers Identification and Evaluation of Cultural Resources (ER 1105-2-50).

Rivers in Crawford County." A brief look at maps 1-3 of Halsey's report shows that the majority of the survey was conducted on the uplands with little work being done in the floodplain. In fact, Halsey states that "the islands in both rivers were excluded and could constitute an object of survey by themselves."

4.03 The most intensive survey of the floodplain has been conducted by Robert Boszhardt (1982). This work was done as part of a large scale survey being conducted by the Department of Anthropology at the University of Wisconsin, Madison. Under the direction of Dr. James Stoltman, the goal of the larger study is the development of a prehistoric subsistence and settlement model for the Prairie du Chien Region (1982:1).

4.04 A comprehensive literature search and records review of the Upper Mississippi River Valley is currently being completed by Dr. David Overstreet of the Great Lakes Archaeological Research Center, Inc. for the St. Paul District. This study, which includes Pool 10, will be available in draft form by the end of September 1982.

5.00 GEOMORPHOLOGY

5.01 The St. Paul District is in the process of initiating a geomorphological survey of Pool 10. The work will be conducted by Dr. Roger Saucier of the Army Corps of Engineer's Waterway Experiment Station. Dr. Saucier has conducted numerous geomorphic studies which focus on how these studies can be used to interpret the archaeological record. The goals of this study are twofold: (1) to describe the geomorphic development of Pool 10, and (2) to determine the relationship between the geomorphic development and the location of archaeological resources within Pool 10, including the potential for buried sites.

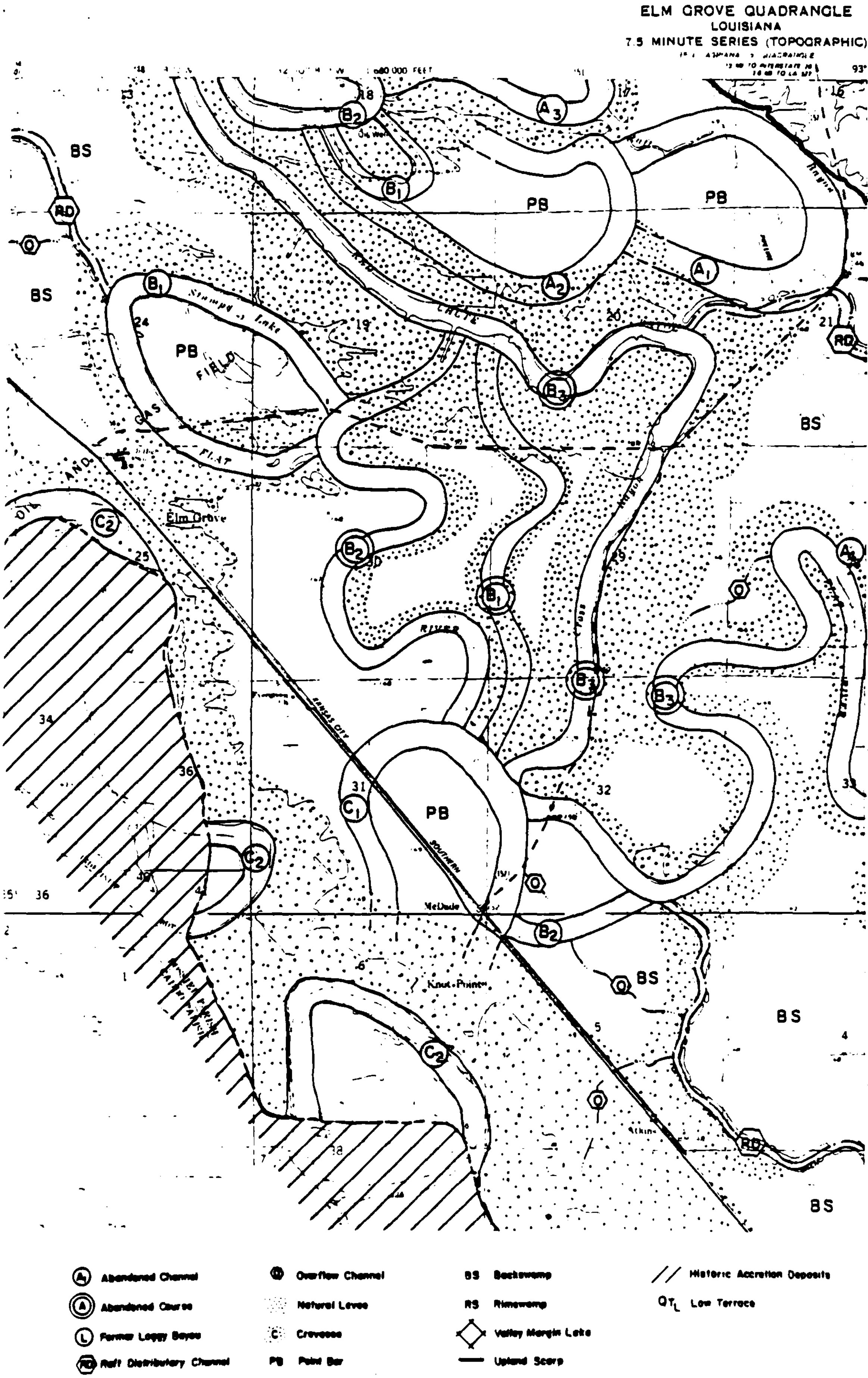
5.02 The study will utilize historic maps of the area, aerial photographs of pre-lock and dam conditions and existing boring records held by the Corps. The results of the study will be the development of a series of U.S.G.S. ($7\frac{1}{2}$ minute) quad sheets showing the riverine geomorphology. An example is given in Plate 1 which shows the geomorphology of the Bayou Bodcau area of Louisiana. The study will also result in a report explaining the geomorphic developments in narrative form. It is anticipated that the maps and report for Pool 10 will be available in Spring 1983.

6.00 PROBABILITY SAMPLE

6.01 While the geomorphic survey will provide some preliminary data on the need for further survey work in Pool 10, for example, recently accreted lands could be eliminated from future survey efforts, the development of a predictive model for site location and the methods and techniques necessary for acquiring this data will depend upon the results of a probability sample of Pool 10.

6.02 The Contractor shall design a sampling strategy which will incorporate the results of the geomorphic survey into the sample design. A stratified random sample is recommended (but not required), using the geomorphic environments as sampling strata. Because of the inundation of these strata in the lower portion of the pool, the sample population will, out of necessity, be limited to the upper portion of the pool.

6.03 The following questions should be considered in the design of a sampling strategy:


ELM GROVE QUADRANGLE
LOUISIANA
7.5 MINUTE SERIES (TOPOGRAPHIC)
BS
PB
Elm Grove
McDade
Knot Point
Abandoned Channel
Abandoned Course
Former Loggy Bayou
Raft Distributary Channel
Overflow Channel
Natural Levee
Crevasse
Point Bar
BS Backswamp
RS Rimswamp
Valley Margin Lake
Upland Scarp
Historic Accretion Deposits
QT_L Low Terrace

a. Is there a correlation between abandoned channels and sites of a specific period?

b. Do certain geomorphic environments show higher probability of sites?

c. Do certain geomorphic environments contain sites which have been deeply buried?

d. What techniques are necessary to locate deeply buried sites in a floodplain environment?

e. Is there a correlation between different geomorphic environments and certain types of sites?

f. Do the probabilities of site locations within a specific geomorphic environment change as a result of its proximity to other controlling factors such as terraces and tributary streams?

6.04 The Contracting Officer shall review and approve the sample design prior to its implementation.

7.00 SURVEY METHODS

7.01 The alluvial nature of the floodplain environment will require survey methods not typical to upland archaeological investigations. While normal shovel testing may be warranted for certain areas, cut bank profiles, coring, boring, backhoe trenching and other forms of deep testing may be necessary for many areas. The nature of this survey will require the Contractor to be extremely flexible in the methods selected and will present a challenge to developing innovative approaches to data extraction.

7.02 Justification of survey methods shall be presented in detail in the technical report. The survey strategy shall be coordinated with the Contracting Officer prior to entering the field.

7.03 Analysis of each survey method or technique shall be made and presented in the technical report. This analysis should show the limitations and benefits of each and the costs associated with their implementation.

8.00 GENERAL REQUIREMENTS

8.01 The Contractor will utilize a systematic, interdisciplinary approach in conducting the study. The Contractor will provide specialized knowledge and skills during the course of the study, to include expertise in archaeology and other social and natural sciences as required. Personnel involved with the work under this contract must meet the minimum professional qualifications outlined in Appendix B.

8.02 The extent and character of the work to be accomplished will be subject to the general supervision, direction, control, and approval of the Contracting Officer.

8.03 Techniques and methodologies used during the investigation shall, at a minimum, be representative of the current state of knowledge for their respective disciplines.

8.04 The Contractor shall keep standard records which shall include, but not be limited to, research notes, site survey forms, maps, and photographs. The original, or a copy, shall be made available to the Contracting Officer upon request.

8.05 The Contractor shall provide all materials and equipment as may be necessary to expeditiously perform those services required of the study.

8.06 The surveyed areas will be returned as closely as practical to presurvey conditions by the Contractor.

8.07 The recommended professional treatment of recovered materials is curation and storage of the artifacts at an institution that can properly insure their preservation and that will make them available for research and public view. If such materials are not in Federal ownership, the Contractor must obtain consent of the owner, in accordance with applicable law, concerning the dispostion of the materials after completion of the report. The Contractor will be responsible for making curatorial arrangements for any collections which are obtained. Such arrangements must be coordinated with the appropriate officials of Wisconsin and Iowa and approved by the Contracting Officer.

8.08 If it becomes necessary in the performance of the work and services, the Contractor shall, at no cost to the Government, secure the rights of ingress and egress on properties not owned or controlled by the Government. The Contractor shall secure the consent of the owner, his representative, or agent, in writing, prior to effecting entry on such property.

9.00 GENERAL REPORT REQUIREMENTS

9.01 The Contractor will submit two types of reports: monthly progress report and draft and final technical reports.

9.02 The monthly progress report will be a brief report submitted with each monthly invoice. Information provided in these reports will describe the status of the study, the work accomplished during the billing period and any noteworthy information such as problems which may have developed.

9.03 The Contractor's technical report shall include, but shall not necessarily be limited to, the following information:

a. Title Page: Note the type of investigation undertaken, the cultural resources assessed (archaeological, historical, and architectural), the project name and location (county and State), the date of the report, the Contractor's name, the contract number, the name of the author(s) and/or Principal Investigator, the signature of the Principal Investigator, and the agency for which the report is being prepared.

b. Abstract: An abstract of findings, conclusions, and recommendations. This should not be an annotation.

c. Management Summary: Concisely summarize the study, which will contain all essential data for using the document in the Corp's management of the project. This information will minimally include who the sponsor is and why the work was undertaken, a summary of the study, study limitations, study results, significance, recommendations, and identification of the repository of all pertinent records and artifacts.

d. Table of Contents.

e. List of Figures.

f. List of Plates.

g. Introduction: Identify the sponsors and the sponsors' reason for the study; provide an overview of the sponsors' project; define the location and boundaries of the study area (with regional or State and area-specific maps); reference this scope of work (to be included in the appendix to the Contractor's report); identify the institute that did the work, the number of people involved in the study, the number of person-days/hours spent during the study; identify the dates when the various types of work were conducted; and identify the repository of records and artifacts.

h. Theoretical and Methodological Overview: Describe or state the goals of the Corps and the study researcher, the theoretical and methodological orientation of the study, and the research strategies applied to achieve the stated goals.

i. Field Methods: Describe specific archaeological activities undertaken to achieve the stated theoretical and methodological goals. Include all field methods, techniques, strategies, and a rationale or justification for specific methods or decisions. The description of the field methods shall minimally include: a description of the areas surveyed, survey conditions, geomorphic environments, vegetation conditions, soil types, informal testing, stratigraphy results, survey limitations, survey testing results, degree of surface visibility, whether or not the survey resulted in the location of any cultural resources, the methods used to survey the area (pedestrian reconnaissance, subsurface test, etc.), the justification and rationale for eliminating uninvestigated areas, and the grid or transect interval used. Testing methods shall include descriptions of test units (size, intervals, stratigraphy, depth) and the rationale behind their placement. Additionally, each method or technique used in the study shall be analyzed to show its limitations, benefits and implementation costs so that future studies can be conducted in the most efficient, expeditious and cost saving manner.

j. Survey Results: Describe all the archaeological resources encountered during the study, and any other data pertinent to a complete understanding of the resources within the study area. Include enough empirical data that the survey results can be independently assessed. The description of the data shall minimally include: a description of the site; amounts and type of material remains recovered; relation of the site or sites to the geomorphic environment, vegetation and soil types; analysis of the site/sites and date (e.g., site(s) type, density, distribution, cultural historical components, environmental, cultural/behavioral inferences or patterns); site condition; and location and size information (elevation, complete quad map source, legal description, and site size, density, depth, and extent) if possible. The information shall be presented in a manner that can be used easily and efficiently.

k. Data Analysis: Describe and provide the rationale for the specific analytic methods and techniques used, and describe and discuss the qualitative and quantative manipulation of the data. Limitations or problems with the analysis based on the data collection results will also be discussed. This section shall also contain references to accession numbers used for all collections, photographs, and field notes obtained during the study, and the location where they are permanently housed. All diagnostic artifacts will be illustrated or photographed and included in the report.

l. Predictive Model: Based upon the results of the survey, describe the predictive model which was developed to correlate site locational data with the geomorphic environments of Pool 10. The predictive model may include information relating to site size, site density, site types, cultural affiliation, cultural/behavioral patterns, etc. Discuss the limitations and reliability of the predictive model for its use in future surveys in Pool 10. The predictive model should attempt to make specific statements on cultural-environmental correlations. Gross generalizations should be avoided. The predictive model should also address the probability of buried archaeological sites and the total number of sites which may exist within the Pool 10 floodplain.

m. Conclusions and Recommendations: Summarize and draw conclusions about the data base for Pool 10, the survey results, the study results, and the predictive model. Describe how the study helped to fill data gaps and outline new research topics which have come to light during the study. Recommendations should focus on the utility of the predictive model and methods and techniques which will be necessary to acquire future data.

n. References: Provide standard bibliographic references (American Antiquity format) for every publication cited in the report.

o. Appendix: Include the scope of work, resumes of all personnel involved, and any other pertinent report information.

9.04 Failure to fulfill these report requirements will result in the rejection of the report by the Contracting Officer.

10.00 FORMAT SPECIFICATIONS

10.01 All text materials will be typed, single-spaced (the draft reports should be space-and-one-half or double-spaced), on good quality bond paper, 8.5 inches by 11.0 inches, with a 1.5-inch binding margin on the left, 1-inch margins on the top and right, and a 1.5-inch margin at the bottom, and will be printed on both sides of the paper.

10.02 Information will be presented in textual, tabular, and graphic forms, whichever are most appropriate, effective, or advantageous to communicate the necessary information.

10.03 All maps will be labeled with a typed or drafted caption/description, a north arrow, a scale bar, township, range, map size, and dates, and the map source (e.g., the USGS quad name, project map title, or published source) and will have proper margins. Maps that are too large to be incorporated in the report may be folded and inclosed at the back of the report or submitted separate from the report. Fold-out maps within the report text are acceptable.

10.04 All figures and maps must be clear, legible, self-explanatory, and of sufficiently high quality to be readily reproducible by standard xerographic equipment.

10.05 The final report cover letter shall include a budget of the project.

10.06 The draft and final reports will be divided into easily discernible chapters, with appropriate page separation and heading.

11.00 MATERIALS PROVIDED

11.01 The Contracting Officer will furnish the Contractor with the following materials:

a. Access to any publications, records, maps, or photographs that are on file at the St. Paul District, Corps of Engineer, and loan copies, if available.

b. Two sets of USGS Quadrangle maps of Pool 10 showing the geomorphic developments. One set will be used as field maps and one set will be returned with the appropriate information (see section 9.03j).

12.00 SUBMITTALS

12.01 The Contractor will submit reports according to the following schedules:

a. Progress Reports: On the first of each month, the Contractor will submit a brief progress report outlining the work accomplished that month and any problems or needs that require the attention of the Corps.

b. Draft Contract Report: Fifteen copies of the draft contract report will be submitted on or before 1 March 1984. The draft contract report will be reviewed by the Corps of Engineers, the State Historic Preservation Officer, the State Archaeologist, and the National Park Service. The draft contract report will be submitted according to the report and contract specifications outlined in this scope of work.

c. Final Contract Report: The original and 15 copies of the final contract report will be submitted 60 days after the Corps of Engineers comments on the draft contract report are received by the Contractor. The final contract report will incorporate all the comments made on the draft contract report.

12.02 Each discovered or relocated site shall be plotted on a set of U.S.G.S maps referenced in 11.01(b) above. Additionally, these maps shall show the location of each sample unit which was surveyed.

12.03 All sites will be recorded on the appropriate State site forms (to be included in the appendix). Inventoried sites shall include a site number. However, if temporary site numbers will be used in either the draft or final reports, they shall be substantially different from the official site designations to avoid confusion or duplication of site numbers. Known sites shall have their State site forms and other forms (e.g., National Register) updated, and included in the appendix.

12.04 The Contractor shall submit upon request of the Contracting Officer all notes, documents, photographs, records, maps, correspondence and any other materials of any nature obtained under this contract.

12.05 The Contractor shall submit the photographic negatives for all black and white photographs which appear in the final report.

12.06 The Contractor shall not release any sketch, photograph, report, or other material of any nature obtained or prepared under this contract without specific written approval of the Contracting Officer prior to the acceptance of the final report by the Government.

13.00 METHOD OF PAYMENT

13.01 Requests for partial payment under this fixed price contract shall be made monthly on ENG Form 93. A 10-percent retained percentage will be withheld from each partial payment. Upon approval of the final reports by the Contracting Officer, final payment, including previously retained percentage, shall be made.

APPENDIX B

Geomorphic-Topographic Maps, Pool 10

Plates 1-7:	Geomorphic Features and locations of archaeological investigations.
Plates 8-11:	Composite overlays of Historic Maps depicting made and lost land, 1900-present.
	(not bound in report)

APPENDIX C

Artifacts from McGregor Lake and Indian
Isle localities, Navigation Pool 10

Key to Illustrations:

A: Side-notched Late Archaic projectile points (Raddatz side-notched/Osceola) from McGregor Lake locality.

B: Stemmed Late Archaic projectile points (Durst stemmed) from McGregor Lake locality.

C: Contracting stemmed projectile points (Waubesa contracting stemmed, Dickson broad-blade) from McGregor Lake locality.

D: Side-notched, excurvate based projectile points (Middle Woodland (?), Gibson-like) from McGregor Lake locality.

E: Small triangular and stemmed late-Woodland/proto-historic projectile points from McGregor Lake locality.

F: Stemmed Middle Woodland projectile points (Steuben stemmed, Monona stemmed) from McGregor Lake locality.

G: Stemmed and Notched Early-Middle Woodland projectile points from the Indian Isle locality.

H: Middle Woodland blade cores (view indicating prepared platforms) from Indian Isle locality.

I: Middle Woodland blade cores (view from distal end along longitudinal axis) from Indian Isle locality.

J: Middle Woodland blades (flake knives) from Indian Isle locality.

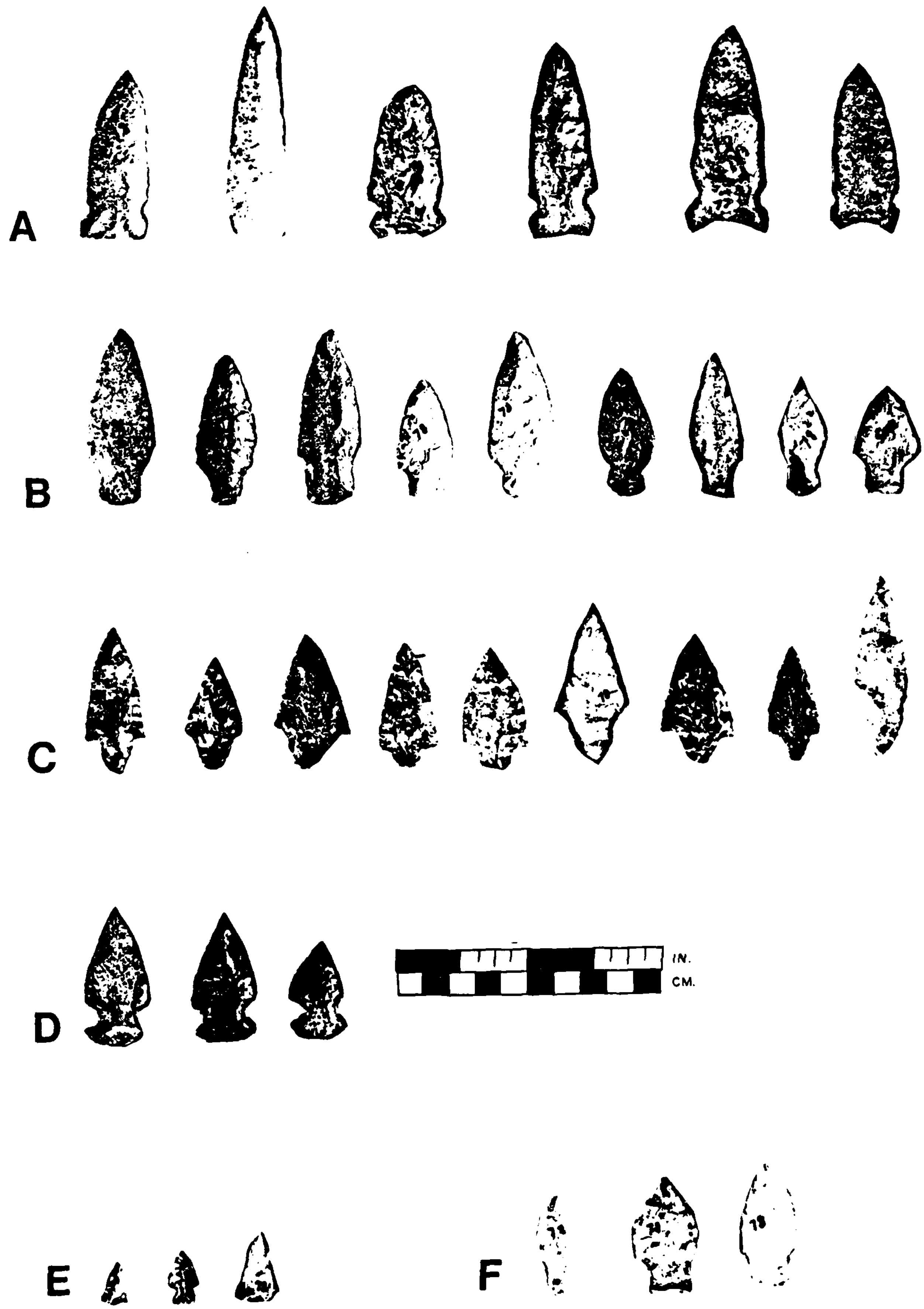
K: Early Woodland (Prairie-McGregor Phase) ceramics (incised over cord-marked, fingernail incised, combed (?)) from Indian Isle locality.

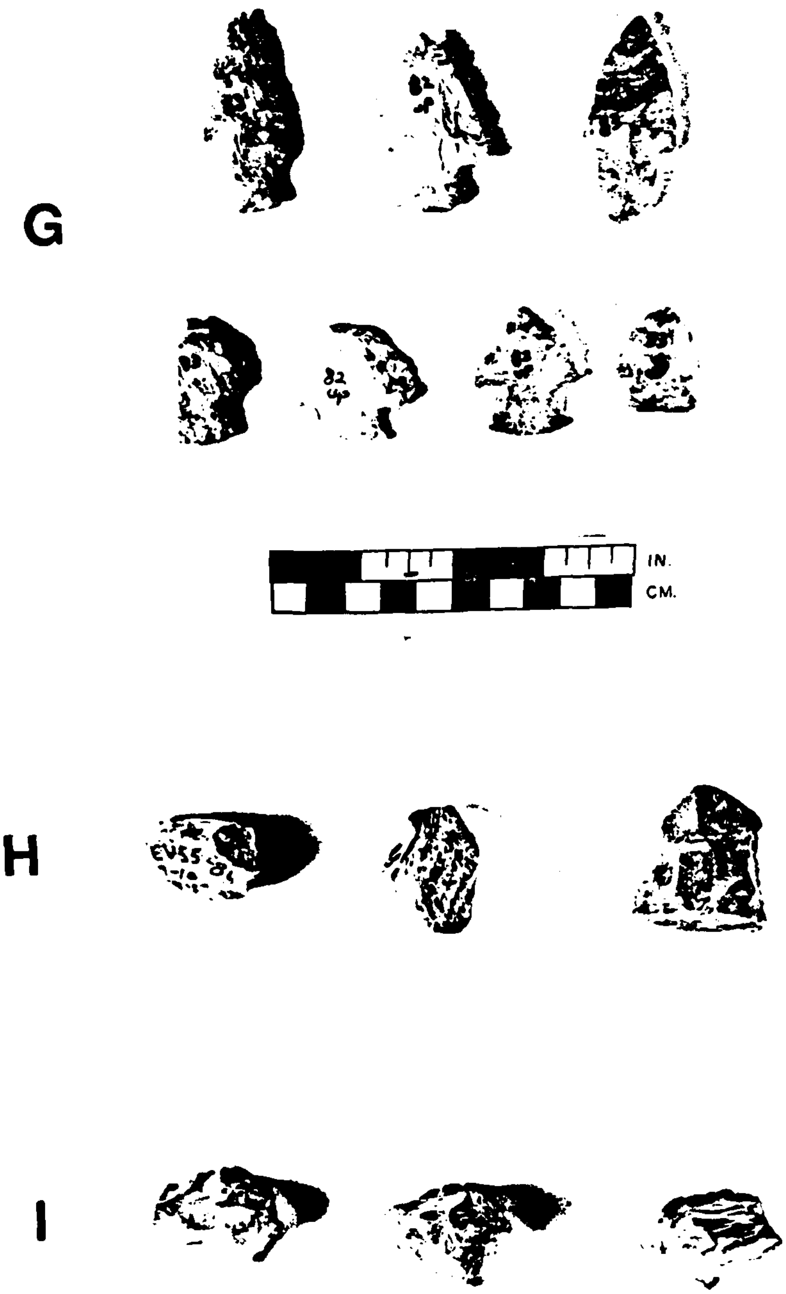
L: Dentate-stamped ceramics (dentates applied to a smooth surface) from the Indian Isle locality.

M: Combined dentate-stamped/fingernail impressed ceramics (applied to a cord-marked surface) from the Indian Isle locality.

N: Crescent-shaped punctated and rocker stamped (badly eroded) ceramics from Indian Isle localitv.

O. Late Woodland cord-impressed and cord-marked (rolled (?)) ceramics from the Indian Isle locality.


A
B
C
D
IN.
CM.
E
F


G
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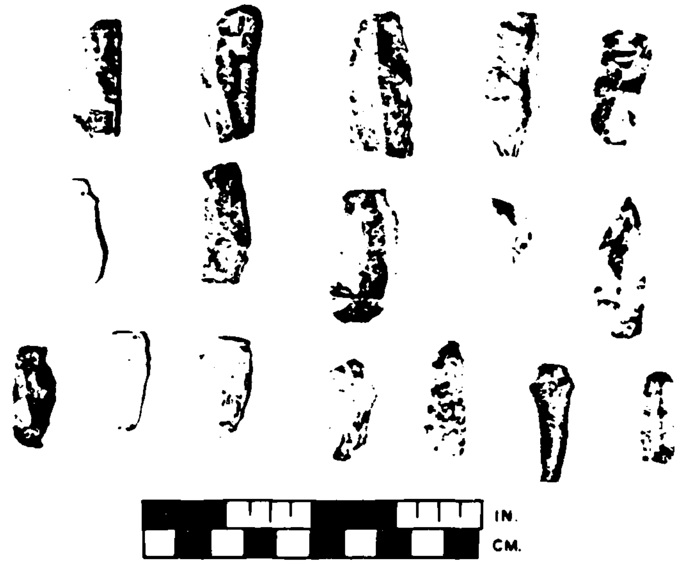
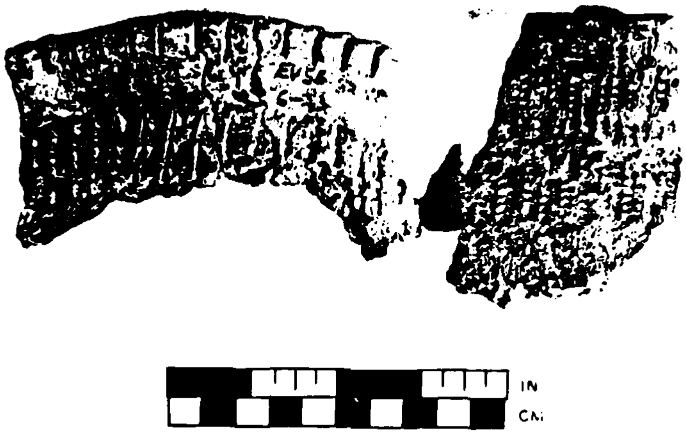
J



K

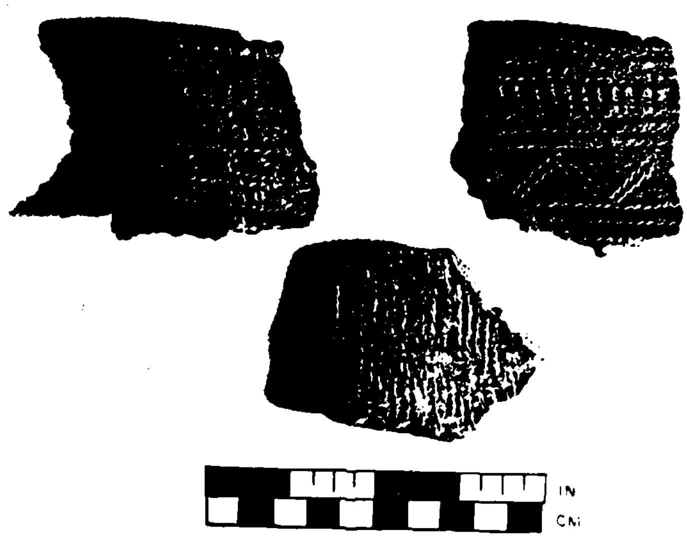
L



M

N

O



APPENDIX D

Site Survey Forms, and State Codification Cards, Navigation Pool 10

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Prairie du Chien Site# 47 Cr 415

Section: SE¼, NW¼-11 Town: T7N Range: R7W

(To ¼, ¼ Section)

Name: Upper Mississippi River (Great 1) Lock and Dam 9 ~~to mile 637. Pool~~ 10

Topo: X Plan:

Date: 1977

U.T.M. Coordinates

Owner: U.S. Government

Address:

Owner Occupied:

yes: no: X

Site Priority (Potential for Destruction): on eroding shoreline

Agency of Destruction: erosion

Type of Site: unknown

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: unknown

Approximate Size (in Meters): N/S X E/W

Drainage: poor

Size Determined From: unknown

Relief: ridge and swale

Elevation (Feet Above Sea Level): 615

pH:

Topography (General Description of Site Environs): lateral accretion

Nearby Water Source (Name if Known): Mississippi River (main channel)

Confluence of:

Soil Type (From Soils Map): alluvium

Present Landuse Pattern: Fish and Wildlife Refuge

Cultural Materials From Site: Biface

Location of Collections: G.L.A.R.C., Inc.

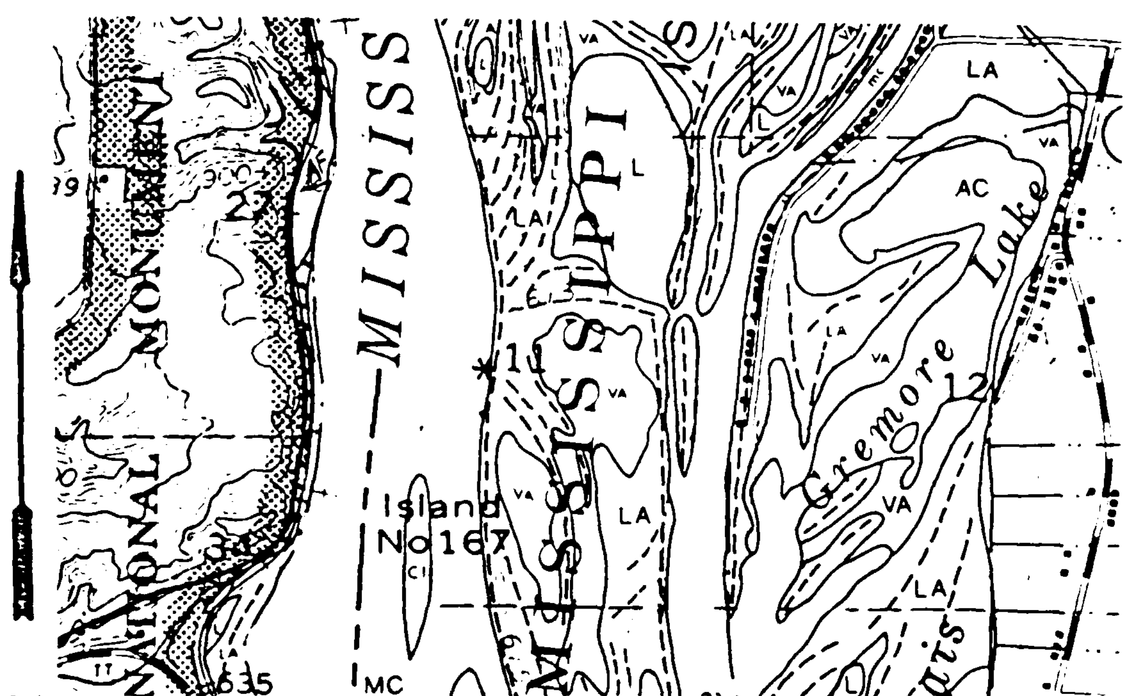
Source of Information: Published . Unpublished X Reference

Actual Visit to Site X Correspondence Conversation

Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84

Affiliation: Unknown

* - denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐
Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐
Quarry ☐ Cave or Rockshelter ☐ Other: Shell midden

47 Cr 415
CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Prairie du Chien T7N R7W	SE¼.NW¼-11	U.S. Government
Reported by: GLARC, Inc. Date 1/30/84				

Geographical Location: On west bank of Island 166, northeast of Island 167.

DESCRIPTION OF SITE: Biface found along shoreline, exposed shell midden.

CULTURE: Unknown

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: GLARC, Inc.

REMARKS: on eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford **Township:** Prairie du Chien **Site#** 47 Cr 416

Section: NE¼,NE¼-14 SE¼,SE¼-11 **Town:** T7N **Range:** R7W **Name:** Upper Mississippi River (Great 1) Lock and Dam 9 to mile 637. Pool 10

(To ¼,¼ Section)

U.T.M. Coordinates ____________ **Topo:** x **Plan:** ______ **Date:** 1977

Owner: U.S. Government

Address: ____________

Owner Occupied: yes: ____ no: x

Site Priority (Potential for Destruction): on eroding Shoreline

Agency of Destruction: erosion

Type of Site: unknown

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: unknown

Approximate Size (in Meters): N/S ____ **X E/W** ____ **Drainage:** poor

Size Determined From: unknown **Relief:** ridge and swale

Elevation (Feet Above Sea Level): 615 **pH:** ____

Topography (General Description of Site Environs): Lateral accretion

Nearby Water Source (Name if Known): Marais Lake

Confluence of: ____________

Soil Type (From Soils Map): Alluvium

Present Landuse Pattern: Fish and Wildlife Refuge

Cultural Materials From Site: Woodland (proj. pts. and pottery)

Location of Collections: Al Reed, Prairie du Chien

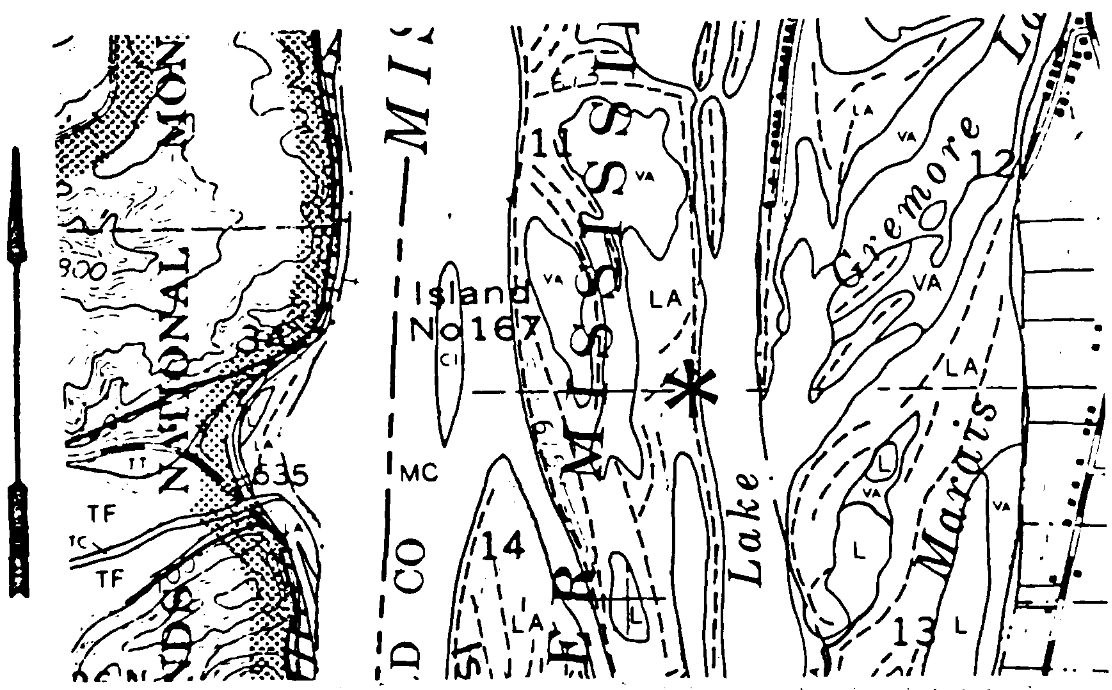
Source of Information: Published ____ Unpublished X Reference ____

Actual Visit to Site ____ **Correspondence** ____ **Conversation** X

Record Prepared by: Paul Lurenz, Jr. **Date:** 1/30/84

Affiliation: Woodland

* - denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐
Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐
Quarry ☐ Cave or Rockshelter ☐ Other:

47 CR 416
CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Prairie du Chien T7N R7W	SE¼,SE¼-11; NE¼,NE¼-14	U.S. Government
Reported by: GLARC, Inc. Date 1/30/84				

Geographical Location On shoreline of Island 166 across from Gremore Lake-Marais Lake confluence

DESCRIPTION OF SITE:

CULTURE: Woodland

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE
IN POSSESSION OF: Al Reed, Prairie du Chien

REMARKS: on eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Prairie du Chien Site# 47 Cr 417

Section: NW¼, SE¼-36 Town: T7N Range: R7W

(To ¼,¼ Section)

Upper Mississippi River (Great 1) Mile 637 to Mile 626
Pool 10

Topo: X Plan:

Date: 1977

U.T.M. Coordinates

Owner: U.S. Government

Address:

Owner Occupied:
yes: no: X

Site Priority (Potential for Destruction): on eroding shoreline

Agency of Destruction: erosion

Type of Site: unknown

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: unknown

Approximate Size (in Meters): N/S X E/W Drainage: poor

Size Determined From: unknown Relief: ridge and swale

Elevation (Feet Above Sea Level): 615 pH:

Topography (General Description of Site Environs): lateral accretion

Nearby Water Source (Name if Known): East Channel of Mississippi

Confluence of:

Soil Type (From Soils Map): Alluvium

Present Landuse Pattern: Fish and Wildlife Refuge

Cultural Materials From Site: lithics and ceramics

Location of Collections: Al Reed, Prairie du Chien

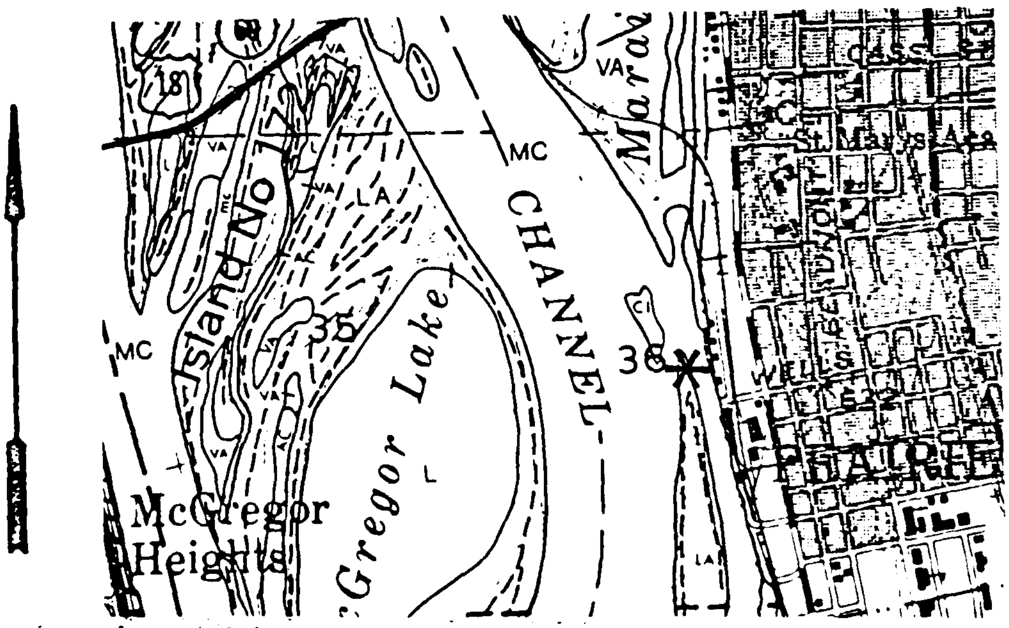
Source of Information: Published Unpublished X Reference

Actual Visit to Site Correspondence Conversation X

Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84

Affiliation: Woodland and Historic

* -denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐
Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐
Quarry ☐ Cave or Rockshelter ☐ Other:

47 Cr 417
CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Prairie du Chien T7N R7W	NW¼,SE¼-36	U.S. Government
Reported by: GLARC, Inc. Date 1/30/84				

Geographical Location On northern point of Island

DESCRIPTION OF SITE:

CULTURE: Woodland and Historic

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: Al Reed, Prairie du Chien

REMARKS: on eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Prairie du Chien Site# 47 CR 418

Section: SW¼,SW¼-12 Town: T7N Range: R7W

(To ¼,¼ Section)

Name: Upper Mississippi River -(Great 1) ~~Pool 10~~ ~~Lock and Dam to~~ 637

Topo: x Plan:

Date: 1977

U.T.M. Coordinates

Owner: U.S. Government

Address:

Owner Occupied:

yes: no: x

Site Priority (Potential for Destruction): on eroding shoreline

Agency of Destruction: erosion

Type of Site: unknown

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: unknown

Approximate Size (in Meters): N/S X E/W

Drainage: poor

Size Determined From: unknown

Relief: ridge and swale

Elevation (Feet Above Sea Level): 615

pH:

Topography (General Description of Site Environs): lateral accretion

Nearby Water Source (Name if Known): Marais Lake and Gremore Lake

Confluence of: Marais Lake and Gremore Lake

Soil Type (From Soils Map): alluvium

Present Landuse Pattern: fish and wildlife Refuge

Cultural Materials From Site: Woodland (lithics and ceramics)

Location of Collections: Al Reed, Prairie du Chien

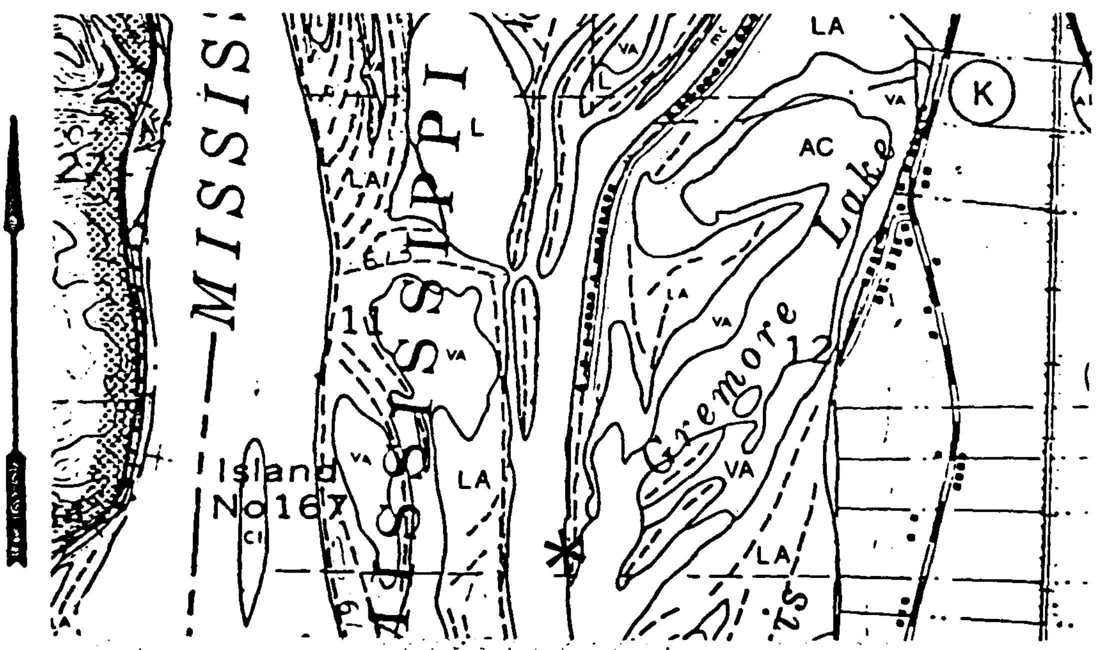
Source of Information: Published Unpublished x Reference

Actual Visit to Site Correspondence Conversation x

Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84

Affiliation: Woodland

* - denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐

Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐

Quarry ☐ Cave or Rockshelter ☐ Other:

47 CR 418

CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Prairie du Chien T7N R7W	SW¼,SW¼-12	U.S. Government
Reported by: GLARC, Inc. Date: 1/30/84				

Geographical Location: At confluence of Gremore Lake and Marais Lake near point

DESCRIPTION OF SITE:

CULTURE: Woodland

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: Al Reed, Prairie du Chien

REMARKS: on eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Prairie du Chien Site# 47 CR 419

Section: NE¼,NE¼-23 Town: T7N Range: R7W

(To ¼,¼ Section)

Name: Upper Mississippi River (Great 1) Lock and Dam 9 to mile 637, Pool 10-

Topo: X Plan: ____

Date: 1977

U.T.M. Coordinates ____

Owner: U.S. Government

Address: ____

Owner Occupied:

yes: ____ no: x

Site Priority (Potential for Destruction): on eroding shoreline

Agency of Destruction: erosion

Type of Site: unknown

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: unknown

Approximate Size (in Meters): N/S ____ X E/W ____ Drainage: poor

Size Determined From: unknown Relief: ridge and swale

Elevation (Feet Above Sea Level): 615 pH: ____

Topography (General Description of Site Environs): lateral accretion

Nearby Water Source (Name if Known): Rôseau Channel and Marais Lake

Confluence of: Roseau Channel and Marais Lake

Soil Type (From Soils Map): alluvium

Present Landuse Pattern: Fish and Wildlife Refuge

Cultural Materials From Site: lithics and ceramics

Location of Collections: Al Reed, Prairie du Chien

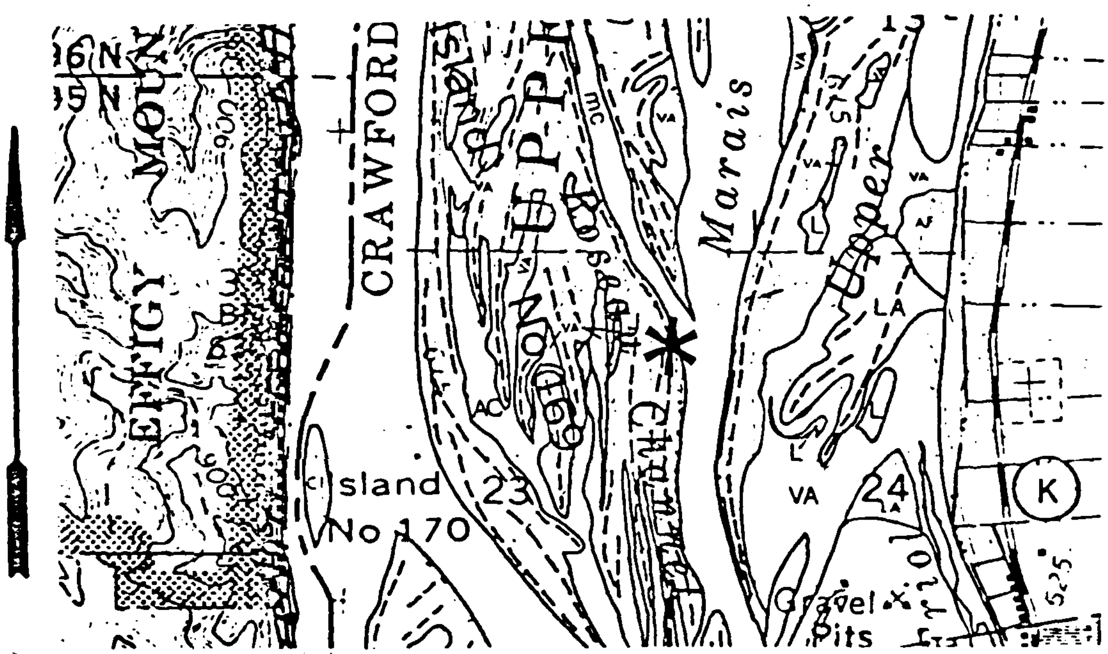
Source of Information: Published ____ Unpublished X Reference ____

Actual Visit to Site ____ Correspondence ____ Conversation X

Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84

Affiliation: Woodland and Mississppian

* - denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐
Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐
Quarry ☐ Cave or Rockshelter ☐ Other:

47 CR 419
CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
Reported by: Date GLARC, Inc. 1/30/84	Crawford	Prairie du Chien T7N R7W	NE¼,NE¼-23	

Geographical Location: On Island #169 at confluence of Roseau Channel and Marais Lake

DESCRIPTION OF SITE:

CULTURE: Woodland and Mississippian

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: Al Reed, Prairie du Chien

REMARKS: On eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Eastman Site# 47 Cr 420

Section: NW¼,SE¼-26 Town: T8N Range: R7W

(To ¼,¼ Section)

Name: Upper Mississippi River (Great 1) Pool 10 Lock and Dam 9 to Mile 637

Topo: X Plan:

Date:

U.T.M. Coordinates

Owner: Private

Address:

Owner Occupied:
yes: no: X

Site Priority (Potential for Destruction): on eroding shoreline

Agency of Destruction: erosion

Type of Site: shell midden

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: hearth

Approximate Size (in Meters): N/S X E/W Drainage: poor

Size Determined From: unknown Relief: ridge and swale

Elevation (Feet Above Sea Level): 615 pH:

Topography (General Description of Site Environs): lateral accretion

Nearby Water Source (Name if Known): Mississippi River

Confluence of: Main Channel of Mississippi R. and Harper's Slough

Soil Type (From Soils Map): Alluvium

Present Landuse Pattern: undeveloped

Cultural Materials From Site: nails and other metal in midden

Location of Collections: G.L.A.R.C., Inc.

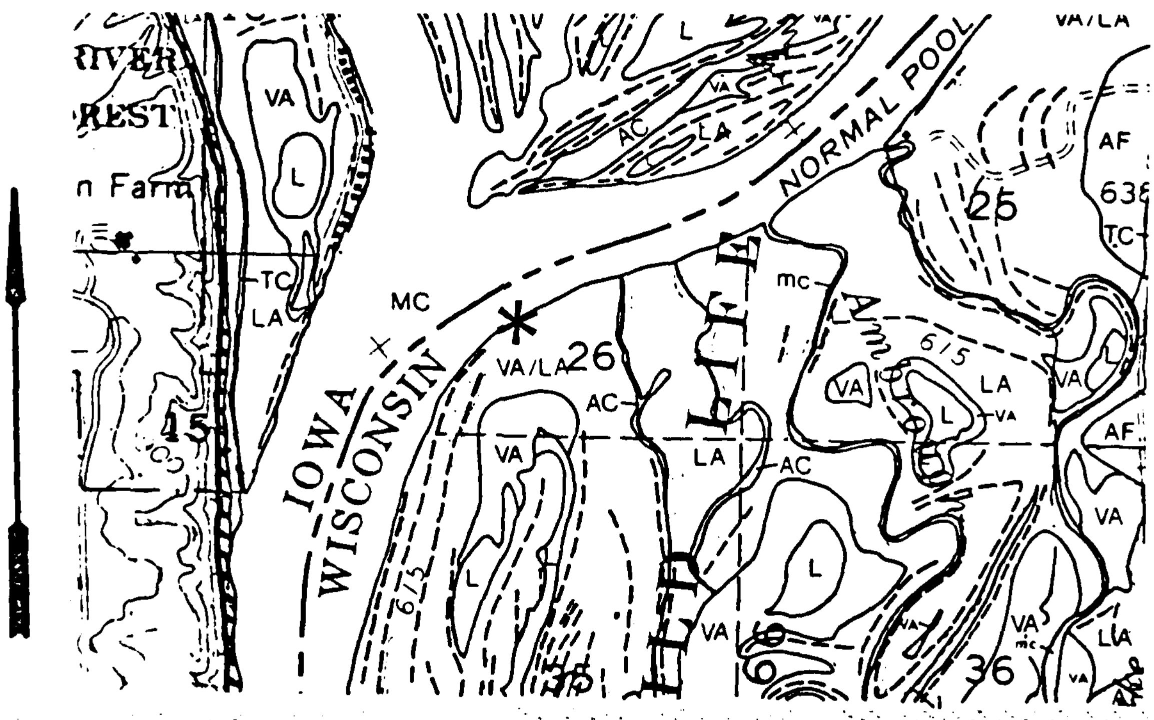
Source of Information: Published . Unpublished X Reference

Actual Visit to Site X Correspondence Conversation

Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84

Affiliation: Historic

* - denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐
Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐
Quarry ☐ Cave or Rockshelter ☐ Other: Shell Midden

47 Cr 420
CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Eastman T8N R7W	NW¼,SE¼-26	
Reported by: GLARC, Inc. Date 1/30/84				

Geographical Location: At the confluence of Harper's Slough and the main Channel of the Mississippi R. on eroding shoreline

DESCRIPTION OF SITE: Historic clam shell midden along shoreline. Nails and hearth uncovered.

CULTURE: Historic

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: GLARC, Inc.

REMARKS:

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Bridgeport Site# 47 Cr 421

Section: SW$\frac{1}{4}$,SW$\frac{1}{4}$-12 Town: T6N Range: R7W

(To $\frac{1}{4}$,$\frac{1}{4}$ Section)

Name: Upper Mississippi River (Great 1) Pool 10 Mile 637 to Mile 626

U.T.M. Coordinates ______

Topo: X Plan: ______

Date: ______

Owner: Private

Address: ______

Owner Occupied:
yes: ____ no: X

Site Priority (Potential for Destruction): on eroding shoreline

Agency of Destruction: erosion

Type of Site: unknown

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: unknown

Approximate Size (in Meters): N/S ____ X E/W ____ Drainage: poor

Size Determined From: unknown Relief: ridge and swale

Elevation (Feet Above Sea Level): 615 pH: ______

Topography (General Description of Site Environs): lateral accretion

Nearby Water Source (Name if Known): Main Channel Mississippi R.

Confluence of: Mississippi R. and Garnet Lake

Soil Type (From Soils Map): Alluvium

Present Landuse Pattern: Undeveloped

Cultural Materials From Site: lithics and ceramics

Location of Collections: Al Reed, Prairie du Chien

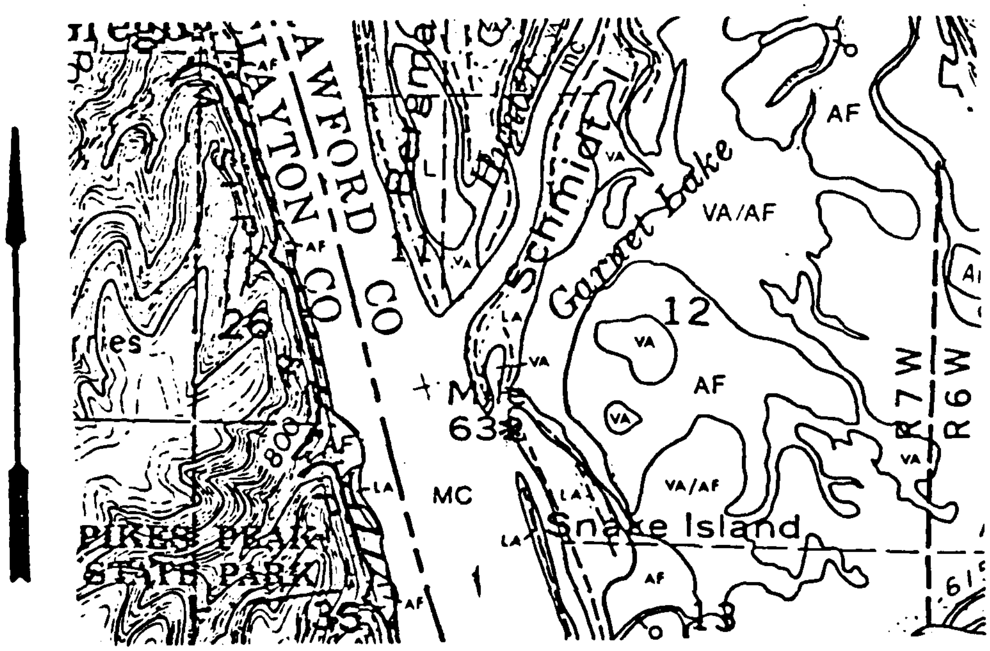
Source of Information: Published ____ Unpublished X Reference ____

Actual Visit to Site ____ Correspondence ____ Conversation X

Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84

Affiliation: Woodland and Historic

* - denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐
Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐
Quarry ☐ Cave or Rockshelter ☐ Other:

47 CR 421

CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Bridgeport T6N R7W	NW¼,SW¼-12	
Reported by: GLARC, Inc. Date 1/30/84				

Geographical Location On northern point of confluence of Garnet Lake and Mississippi R.

DESCRIPTION OF SITE:

CULTURE: Woodland and Historic

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: Al Reed, Prairie du Chien

REMARKS: On eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Bridgeport Site# 47 Cr 422

Section: NW¼,NW¼-13 Town: T6N Range: R7W Name: Upper Mississippi River (Great 1) Pool 10 - Mile 637 to mile 626

(To ¼,¼ Section)

U.T.M. Coordinates Topo: X Plan:

Date: 1977

Owner: Private Owner Occupied:

Address: yes: no: X

Site Priority (Potential for Destruction): on eroding shoreline

Agency of Destruction: erosion

Type of Site: unknown

Site Presence Determined From: shoreline survey

Archaeological Sub-Surface Features: unknown

Approximate Size (in Meters): N/S X E/W Drainage: poor

Size Determined From: unknown Relief: ridge and swale

Elevation (Feet Above Sea Level): 615 pH:

Topography (General Description of Site Environs): lateral accretion

Nearby Water Source (Name if Known): Main Channel Mississippi River

Confluence of:

Soil Type (From Soils Map): Alluvium

Present Landuse Pattern: undeveloped

Cultural Materials From Site: lithics and ceramics

Location of Collections: Al Reed, Prairie du Chien

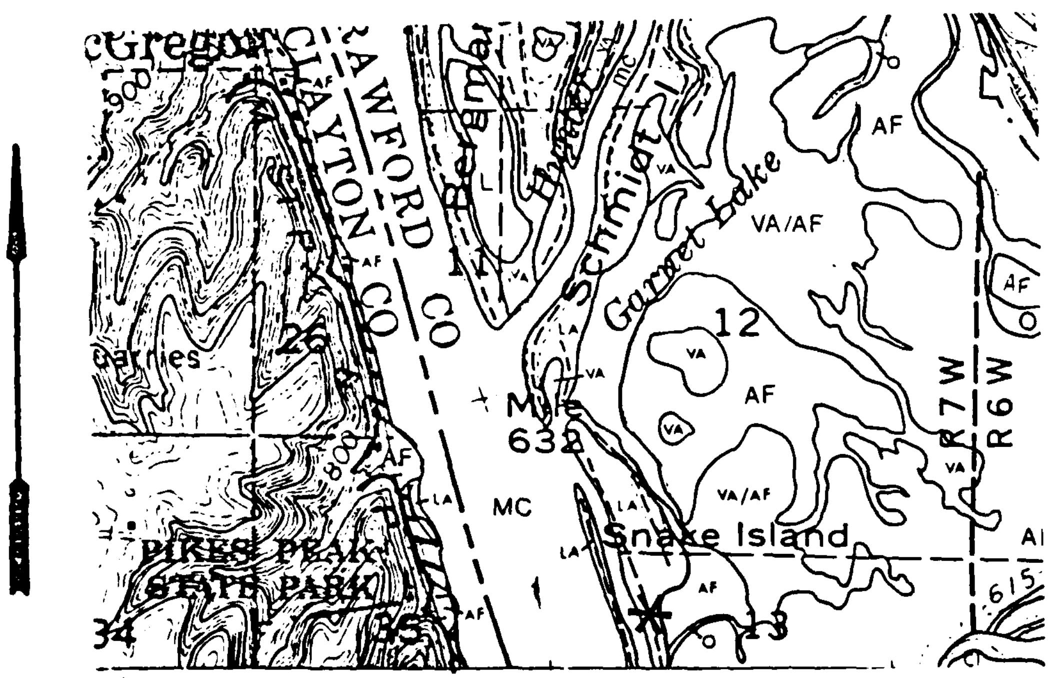
Source of Information: Published Unpublished X Reference

Actual Visit to Site Correspondence Conversation x

Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84

Affiliation: Woodland and Historic

* - denotes site location



TYPE OF SITE:

Mounds ☐	Village ☐	Campsite ☐	Garden Beds ☐
Petroglyphs ☐	Worksite ☐	Cemetery ☐	Cache ☐
Quarry ☐	Cave or Rockshelter ☐	Other:	

47 CR 422

CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Bridgeport T6N R7W	NW¼,NW¼-13	
Reported by: GLARC,Inc. Date 1/30/84				

Geographical Location East of Snake Island on eroding shoreline.

DESCRIPTION OF SITE:

CULTURE: Woodland and Historic

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: Al Reed, Prairie du Chien

REMARKS: On eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

SITE SURVEY DATA SHEET

Great Lakes Archaeological Research Center, Inc.

County: Crawford Township: Bridgeport Site# 47 Cr 423

Section: NW¼,SW¼-12 Town: T6N Range: R7W Upper Mississippi River
(To ¼,¼ Section) Name: (Great 1) Pool 10
Mile 637 to Mile 626

U.T.M. Coordinates ____________

Topo: X Plan: ____
Date: ____

Owner: Private
Address: ____________

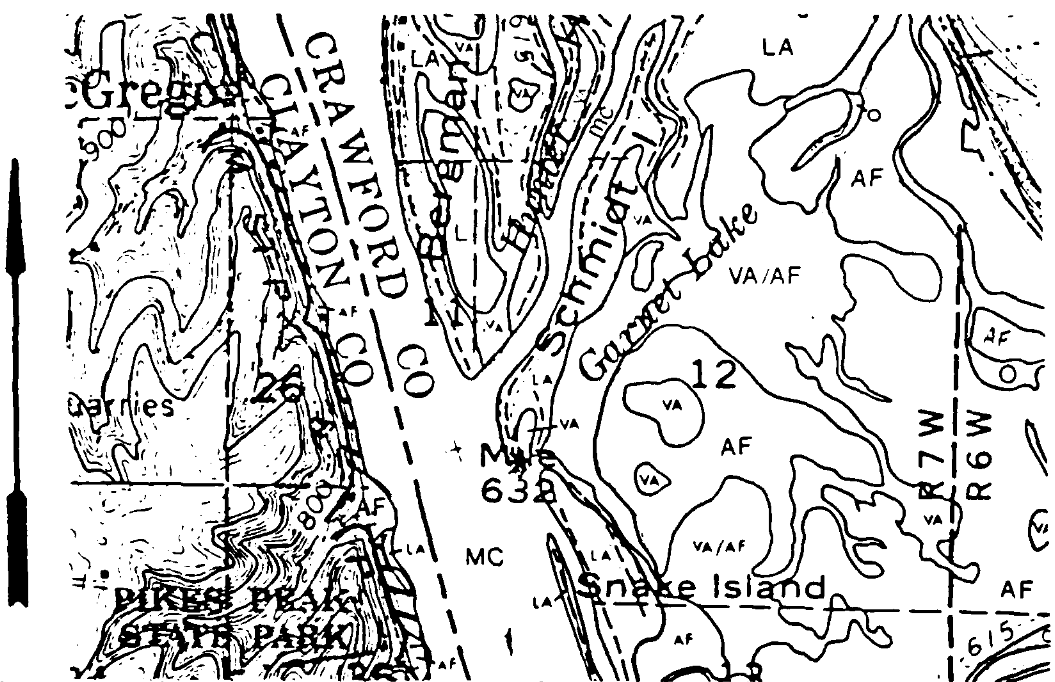
Owner Occupied:
yes: ___ no: X

Site Priority (Potential for Destruction): on eroding shoreline
Agency of Destruction: erosion
Type of Site: unknown
Site Presence Determined From: shoreline survey
Archaeological Sub-Surface Features: unknown
Approximate Size (in Meters): N/S ____ X E/W ____ Drainage: poor
Size Determined From: unknown Relief: ridge and swale
Elevation (Feet Above Sea Level): 615 pH: ____
Topography (General Description of Site Environs): lateral accretion
Nearby Water Source (Name if Known): Main Channel Mississippi R.
Confluence of: Mississippi R. and Garnet Lake
Soil Type (From Soils Map): Alluvium
Present Landuse Pattern: undeveloped
Cultural Materials From Site: lithics and ceramics

Location of Collections: Al Reed, Prairie du Chien
Source of Information: Published ____ Unpublished X Reference ____

Actual Visit to Site ____ Correspondence ____ Conversation X
Record Prepared by: Paul Lurenz, Jr. Date: 1/30/84
Affiliation: Woodland and Historic

* - denotes site location



TYPE OF SITE:

Mounds ☐ Village ☐ Campsite ☐ Garden Beds ☐

Petroglyphs ☐ Worksite ☐ Cemetery ☐ Cache ☐

Quarry ☐ Cave or Rockshelter ☐ Other:

47 CR 423
CODE NUMBER

Name of site	County	Township and range	Location in section	Present owner
	Crawford	Bridgeport T6N R7W	SW¼,SW¼-12	
Reported by: GLARC,Inc. Date 1/30/84				

Geographical Location North of Snake Island at confluence of Garnet Lake and Mississippi R. on southern point.

DESCRIPTION OF SITE:

CULTURE: Woodland and Historic

REFERENCES: Wisconsin Archeologist Series Vol. No. Page

SPECIMENS FROM SITE IN POSSESSION OF: Al Reed, Prairie du Chien

REMARKS: On eroding shoreline

WISCONSIN ARCHEOLOGICAL CODIFICATION FILE

APPENDIX E

Lot Check Lists, Cultural Materials

LOT CHECK LIST

Lot Number 1 **Site Name** Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location 7.5' Cm. Below Surface. Date Collected 9/27/83

Associations Bucket Auger Sample

CONTENTS:

Ceramics ______

Lithics 1 chert waste flake

Rough Rock 1 water rolled pebble

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 2 Site Name Fox Deluxe

Feature Number Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S Meters E W

Vertical Location 8.0' Cm. Below Surface. Date Collected 9/27/83

Associations Bucket auger sample

CONTENTS:

Ceramics

Lithics 1 waste flake

Rough Rock 4 water rolled pebbles

Bone

Charcoal

Historic

Other

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 3 Site Name Fox Deluxe

Feature Number Test Pit A Site Number 47 Cr 340

Horizontal Location ______ Meters N S ______ Meters E W ______

Vertical Location 8.5' Cm. Below Surface. Date Collected 9/27/83

Associations ______

CONTENTS:

Ceramics ______

Lithics ______

Rough Rock 4 water rolled pebbles

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 4 Site Name Fox Deluxe

Feature Number Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S Meters E W

Vertical Location 8.8' Cm. Below Surface. Date Collected 9/27/83

Associations

CONTENTS:

Ceramics

Lithics

Rough Rock 2 water rolled pebbles

Bone

Charcoal

Historic

Other

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 5 Site Name Fox Deluxe

Feature Number Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S Meters E W

Vertical Location Level 1 Cm. Below Surface. Date Collected 9/27/83

Associations

CONTENTS:

Ceramics

Lithics

Rough Rock 1 water rolled pebble

Bone

Charcoal

Historic

Other 1 clamshell fragment

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 6 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 2 Cm. Below Surface. Date Collected 9/28/83

Associations ______

CONTENTS: STERILE LEVEL

Ceramics ______

Lithics ______

Rough Rock ______

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By ______ Sorted By ______ Labeled By ______

Date ______ Date ______ Date ______

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 7 Site Name Fox Deluxe

Feature Number Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S Meters E W

Vertical Location Level 3 Cm. Below Surface. Date Collected 9/28/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics

Lithics

Rough Rock 5 water rolled pebbles

Bone

Charcoal

Historic

Other 1 clamshell fragment

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 8 Site Name Fox

Feature Number ______ Site Number 47

Horizontal Location Test Pit A Meters N S ______

Vertical Location Level 4 Cm. Below Surface.

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics ______

Lithics ______

Rough Rock 4 water rolled pebbles

Bone 8 unidentifiable burned bone fragments

Charcoal ______

Historic 1 ceramic sherd

Other 2 clamshell fragments

Washed By P.L. Sorted By J.C.

Date 10/3/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______

Sorted By ______

LOT CHECK LIST

Lot Number 9 **Site Name** Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 5 Cm. Below Surface. Date Collected 9/29/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics 1 grit tempered, decorated rimsherd

Lithics 5 quartzite flakes, 2 quartzite bipolar cores, 1 quartzite biface fragment (w/ground edge)

Rough Rock 1 water rolled pebble

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 10 Site Name Fox Deluxe

Feature Number ______ Site Number ______

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 6 Cm. Below Surface. Date Collected 9/28/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics 4 cordmarked grit tempered sherds

Lithics 1 chert wasteflake

Rough Rock 1 broken pebble

Bone ______

Charcoal 1 fragment wood charcoal

Historic ______

Other ______

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 11 **Site Name** Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 2 Cm. Below Surface. Date Collected 9/28/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics 9 undecorated, 3 decorated grit tempered body sherds

Lithics 1 borken triangular projectile point, 2 shatter, 4 waste flakes

Rough Rock 2 broken pebbles

Bone ______

Charcoal present in level floor, some pieces retrieved (.30g)

Historic ______

Other ______

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 12 Site Name Fox Deluxe

Feature Number Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S Meters E W

Vertical Location Level 8 Cm. Below Surface. Date Collected 9/28/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics 2 sandy pasted decorated body sherds, 1 plain body sherd (sandy paste), 1 grit tempered cordmarked sherd

Lithics

Rough Rock

Bone

Charcoal

Historic

Other 1 fragment decomposed wood

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/2/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 13 Site Name Fox Deluxe

Feature Number _____ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S _____ Meters E W _____

Vertical Location Level 9 Cm. Below Surface. Date Collected 9/29/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics 3 eroded sherds (water-rolled?)

Lithics 1 chert waste flake

Rough Rock 1 water rolled pebble

Bone _____

Charcoal _____

Historic _____

Other _____

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: _____

Soil Description _____

Associations _____

Collected By _____ Date _____

Sorted By _____ Date _____

LOT CHECK LIST

Lot Number 14 **Site Name** Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 10 Cm. Below Surface. Date Collected 9/28/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics ______

Lithics 12 chert waste flakes, 1 shatter

Rough Rock 12 water rolled pebbles

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 15 Site Name Fox Deluxe

Feature Number Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S Meters E W

Vertical Location Level 11 Cm. Below Surface. Date Collected 9/29/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics 1 decorated, grit tempered body sherd (fingernail punctate w/bosses)

Lithics

Rough Rock 2 water rolled pebbles

Bone

Charcoal

Historic

Other

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 17 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 13 Cm. Below Surface. Date Collected 9/29/83

Associations SE 1/4 of 2x2m square

CONTENTS:

Ceramics ______

Lithics 1 chert waste flake

Rough Rock ______

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 18 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 14 Cm. Below Surface. Date Collected ______

Associations SE 1/4 of 2x2m square

CONTENTS: STERILE LEVEL

Ceramics ______

Lithics ______

Rough Rock ______

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By ______ Sorted By ______ Labeled By ______

Date ______ Date ______ Date ______

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 19 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 15 Cm. Below Surface. Date Collected 9/29/83

Associations SE 1/4 of 2x2m square

CONTENTS: STERILE LEVEL

Ceramics ______

Lithics ______

Rough Rock ______

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By ______ Sorted By ______ Labeled By ______

Date ______ Date ______ Date ______

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 20 **Site Name** Fox Deluxe

Feature Number ______ **Site Number** 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 3 Cm. Below Surface. Date Collected 9/27/83

Associations west 1/2 of 2x2m square

CONTENTS:

Ceramics ______

Lithics ______

Rough Rock ______

Bone ______

Charcoal ______

Historic 6 ceramic sherds

Other ______

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 21 **Site Name** Fox Deluxe

Feature Number ____ **Site Number** 47 Cr 340

Horizontal Location Test Pit A Meters N S ____ Meters E W ____

Vertical Location Levels 5-6 Cm. Below Surface. Date Collected 9/27/83

Associations west 1/2 of 2x2m square

CONTENTS:

Ceramics 1 decorated, 1 plain, 1 cordmarked sherd, all grit tempered

Lithics ____

Rough Rock ____

Bone ____

Charcoal 2 wood charcoal fragments (.10g)

Historic ____

Other ____

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ____

Soil Description ____

Associations ____

Collected By ____ Date ____

Sorted By ____ Date ____

LOT CHECK LIST

Lot Number 22 **Site Name** Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location 60-85 Cm. Below Surface. Date Collected 9/27/83

Associations Wall scrapings

CONTENTS:

Ceramics ______

Lithics 4 chert wasteflakes

Rough Rock 4 water rolled pebbles, 1 spall from a larger cobble, 1 FCR

Bone ______

Charcoal ______

Historic ______

Other 1 rotted wood fragment

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 23 **Site Name** Fox Deluxe

Feature Number ______ **Site Number** 47 Cr 340

Horizontal Location Test Pit A **Meters N S** ______ **Meters E W** ______

Vertical Location 100 **Cm. Below Surface. Date Collected** 9/28/83

Associations west wall of SW 1/4 of 2x2m square

CONTENTS:

Ceramics 1 undecorated grit tempered body sherd

Lithics ______

Rough Rock 1 blocky piece of oolitic chert

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. **Sorted By** P.L. **Labeled By** P.L.

Date 10/3/83 **Date** 10/4/83 **Date** 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ **Date** ______

Sorted By ______ **Date** ______

LOT CHECK LIST

Lot Number 24 **Site Name** Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location 120-140 Cm. Below Surface. Date Collected 9/29/83

Associations Wall scrapings, west 1/2 of 2x2m square

CONTENTS:

Ceramics ______

Lithics 2 chert wasteflakes

Rough Rock ______

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 25 **Site Name** Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 23 Cm. Below Surface. Date Collected 9/28/83

Associations ______

CONTENTS:

Ceramics ______

Lithics 1 chert wasteflake

Rough Rock ______

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 26 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 24 Cm. Below Surface. Date Collected 9/29/83

Associations NW 1/4 of 2x2m square

CONTENTS:

Ceramics ______

Lithics 17 chert wasteflakes

Rough Rock 6 water rolled pebbles, 1 burned limestone chunk

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 27 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 25 Cm. Below Surface. Date Collected 9/29/83

Associations NW 1/2 of 2x2m square

CONTENTS:

Ceramics ______

Lithics 1 biface fragment (heat treated), 67 wasteflakes, all chert

Rough Rock 19 water rolled pebbles, 4 fragments FCR or exfoliated igneous rock

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 28 Site Name Fox Deluxe

Feature Number ____ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ____ Meters E W ____

Vertical Location Level 26 Cm. Below Surface. Date Collected 9/29/83

Associations NW 1/4 of 2x2m square

CONTENTS:

Ceramics ____

Lithics 1 biface fragment, 1 preform, 8 shatter, 152 waste flakes, all chert

Rough Rock 21 water rolled pebbles

Bone ____

Charcoal ____

Historic ____

Other ____

Washed By P.L. Sorted By P.L. Labeled By P.L.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ____

Soil Description ____

Associations ____

Collected By ____ Date ____

Sorted By ____ Date ____

LOT CHECK LIST

Lot Number 29 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location Level 27 Cm. Below Surface. Date Collected 9/30/83

Associations NW 1/4 of 2x2m square

CONTENTS:

Ceramics ______

Lithics 17 chert waste flakes

Rough Rock 20 water rolled pebbles, 1 water rolled chert cobble fragment

Bone ______

Charcoal ______

Historic ______

Other 1 fragment partially decomposed wood

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 30 Site Name Fox Deluxe

Feature Number Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S / Meters E W

Vertical Location 230-250 Cm. Below Surface. Date Collected 9/29/83

Associations NW 1/4 of 2x2m square, wall scrapings

CONTENTS:

Ceramics

Lithics 29 chert waste flakes

Rough Rock 4 water rolled pebbles

Bone

Charcoal

Historic

Other

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 31 Site Name Fox Deluxe

Feature Number ______ Site Number 47 Cr 340

Horizontal Location Test Pit A Meters N S ______ Meters E W ______

Vertical Location 230-260 Cm. Below Surface. Date Collected 9/30/83

Associations NW 1/4 of 2x2m square, wall scrapings

CONTENTS:

Ceramics ______

Lithics 58 chert wasteflakes

Rough Rock 5 water rolled pebbles

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

LOT CHECK LIST

Lot Number 32 **Site Name** Fox Deluxe

Feature Number **Site Number** 47 Cr 340

Horizontal Location Test Pit A Meters N S Meters E W

Vertical Location 245-255 Cm. Below Surface. Date Collected 9/30/83

Associations NW 1/4 of 2x2m square, wall scrapings

CONTENTS:

Ceramics

Lithics 1 large chert flake (7x4x2 cm), 95 chert waste flakes

Rough Rock 5 water rolled pebbles

Bone

Charcoal

Historic

Other

Washed By P.L. Sorted By J.C. Labeled By J.C.

Date 10/3/83 Date 10/4/83 Date 10/4/83

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 1 Site Name

Feature Number Site Number 47 Cr 420

Horizontal Location Unit A Meters N S Meters E W

Vertical Location 40 Cm. Below Surface. Date Collected 9/1/83

Associations Mixed within shell midden matrix, on hearth below midden

CONTENTS:

Ceramics

Lithics

Rough Rock

Bone

Charcoal

Historic 2 cut, 2 round nails on hearth below midden, 2 round, 1 cut nail within shell matrix.

Other Naiad matrix removed as stratigraphic unit (refer to Table 2)

Washed By B.O. Sorted By B.O. Labeled By B.O.

Date 1/16/84 Date 1/16/84 Date 1/16/84

FLOATATION INVENTORY

CONTENTS:

Soil Description

Associations

Collected By Date

Sorted By Date

LOT CHECK LIST

Lot Number 1 **Site Name** FTD Site

Feature Number ______ **Site Number** 13 Am 210

Horizontal Location Log 82-27:02 Meters N S ______ Meters E W ______

Vertical Location 12.0' Cm. Below Surface. Date Collected 10/2/83

Associations Bucket Auger sample

CONTENTS: small fragments of bone (burned and unburned), charcoal, charcoal, burned rough rock, chert waste flakes

Ceramics ______

Lithics ______

Rough Rock ______

Bone ______

Charcoal ______

Historic ______

Other ______

Washed By DFO Sorted By DFO Labeled By DFO

Date 1/12/84 Date 1/12/84 Date 1/12/84

FLOATATION INVENTORY

CONTENTS: ______

Soil Description ______

Associations ______

Collected By ______ Date ______

Sorted By ______ Date ______

APPENDIX F

Curriculum Vitae, Key Personnel

CURRICULUM VITA

DAVID FREDERIC OVERSTREET

PII Redacted [redacted]

Special Areas of Interest:

North American Prehistory, Ethnography, and Ethnohistory, Great Lakes Region. Historical Archaeology-19th Century Logging Industry. Public Education, Cultural Resources Management, and Administration. Historic Preservation Laws.

Academic History:

Bachelor of Science, Anthropology, University of Wisconsin-Milwaukee, 1968
Master of Science, Anthropology, University of Wisconsin-Milwaukee, 1971
Doctor of Philosophy, Anthropology, University of Wisconsin-Milwaukee, 1976

(Data universe: Horticultural Societies; Geographic Region; Prehistory and Ethnology, Eastern United States; Dissertation Title: "The Grand River, Koshkonong, Green Bay, and Lake Winnebago Phases--Eight Hundred Years of Eastern Wisconsin Oneota Prehistory." Foreign Language proficiency: Spanish and French. Minor Studies: Linguistics)

Membership in Professional Organizations and Societies:

Society for American Archaeology, Wisconsin State Representative Committee for Public Archaeology. 1978, 1979, 1980.
American Anthropological Association
American Association for the Advancement of Science
American Museum of Natural History, Associate Member
Missouri Archaeological Society
Minnesota Archaeological Society
Michigan Archaeological Society
Wisconsin Archaeological Society, President 1976-77, Board of Directors 1978-82, Program Chairman 1974-77, 1980-82, Editor, The Wisconsin Archeologist, 1977-82.
The State Historical Society of Wisconsin
The Waukesha County Historical Society, Board of Directors 1982
The Wisconsin Academy of Arts, Science, and Letters
The Wisconsin Archaeological Survey, Secretary-Treasurer 1976-77, President 1978-79.
The Iowa Archaeological Society

Professional Papers presented:

1971 Midwest Archaeological Field Conference, Cleveland, Ohio.
1971 The Wisconsin Archaeological Society, Milwaukee, Wisconsin.
1972 The Wisconsin Archaeological Society, Milwaukee, Wisconsin.
1973 The Wisconsin Archaeological Society, Milwaukee, Wisconsin.
1974 Society for American Archaeology, Washington, D.C.
1974 Midwest Archaeological Field Conference, Milwaukee, Wisconsin.
1975 Northland College, Apostle Island National Lakeshore Research Symposium, Ashland, Wisconsin.
1975 Invited participant, Woodland Survey Conference, Northern Michigan University, Marquette, Michigan.
1975 Cultural Resources Symposium, University of Wisconsin-Waukesha County.
1976 Invited Participant, Woodland Survey Conference, University of Wisconsin-Marathon County.
1976 Logan Museum of Anthropology, Beloit College, Beloit, Wisconsin.
1976 Midwest Archaeological Field Conference-Plains Anthropology Conference (joint meeting), Minneapolis, Minnesota.
1976 The Wisconsin Archaeological Society, Milwaukee, Wisconsin.
1976 The Wisconsin Archaeological Society, Charles E. Brown Chapter, Madison, Wisconsin.
1978 Kenosha Public Museum, Kenosha, Wisconsin.
1978 The Wisconsin Archaeological Society, Dr. Bruder Chapter, Mayville, Wisconsin.
1978 The Wisconsin Archaeological Society, Fox Valley Chapter, Oshkosh Public Museum, Oshkosh, Wisconsin.
1978 The Wisconsin Archaeological Society, Charles E. Brown Chapter, Madison, Wisconsin.
1978 The Wisconsin Archaeological Society, Milwaukee, Wisconsin.
1979 The Wisconsin Academy of Science, Arts, And Letters, Carthage College, Kenosha, Wisconsin.
1980 Current Directions in Midwestern Archaeology, sponsored by Mankato State University and the Council for Minnesota Archaeology, Mankato, Minnesota.

Public Service Presentations:

Various presentations to government agencies such as the United States Forest Service, National Park Service, Department of Natural Resources, Planning Commissions, etc. Various presentations to both elementary and secondary school groups. Various presentations to professional organizations Lion's club, Legal Secretaries, Questars Club, etc. Various presentations to local historical societies and church groups.

Professional Publications:

1972 The Archaeological Survey of the Columbia Power Plant, The Wisconsin Archeologist, ns., Vol. 53 (2).

1974 A Rapid Field Test for Archaeological Site Survey: An Application and Evaluation. The Wisconsin Archeologist, n.s., Vol. 55 (4).

1975 Summary Report: Archaeological Survey of Madeline Island. Manuscript on file, Department of the Interior and The State Historical Society of Wisconsin.

1976 Summary Report: Archaeological Inventory and Evaluation of the Cultural Resources within the Apostle Islands National Lakeshore. The Logan Museum of Anthropolgy, Beloit College, Beloit, Wisconsin.

1977 Wisconsin Binomial Pottery Types and Oneota Prehistory. The Wisconsin Archeologist, ns. Vol. 58 (2).

1978 Oneota Settlement Patterns in Eastern Wisconsin--Some Consideration of Time and Space. In: Mississippian Settlement Patterns, Bruce Smith, ED. Academic Press.

1980a The Convent Knoll Site (47 Wk 327): A Red Ocher Cemetery in Waukesha County, Wisconsin. The Wisconsin Archeologist, n.s., Vol. 61 (2).

1980b Archaeological Recovery at 11-Ri-337, an Early Middle Woodland Shell Midden in East Moline, Illinois. The Wisconsin Archeologist, n.s. Vol. 61 (2).

1981a Investigations at the Pipe Site (47-Fd-10) with an Interpretation of Eastern Wisconsin Oneota Prehistory. The Wisconsin Archeologist, m.s. Vol. 62 (4).

1981b Applications of Menominee-Winnebago Subsistence Patterns to Lake Prehistoric Manifestations in the Green Bay Coastal Corridor. In: Current Directions in Midwestern Archaeology--Selected Papers from the Mankato Conference, Scott F. Anfinson, ED. Occasional Publications in Minnesota Anthropology No. 9.
Minnesota Archaeological Society.

In Press: An Early Date from the Hixton Rockshelter, Jackson County, Wisconsin.

Preliminary Report on excavations at the Mile-Long Site (47 Wl 110), Walworth County, Wisconsin.

Reviews:

1980 A Handbook of Minnesota Prehistoric Ceramics. Occasional Publications in Minnesota Anthropology, No. 5. S.F. Anfinson, Ed. In: The Wisconsin Archeologist, Vol. 61 (1).

1981a Oneota Culture in Northwestern Iowa. Amy E. Harvey. Report 12, Office of the State Archaeologist, The University of Iowa. In: Plains Anthropologist, 26-91

1981b A Handbook of Minnesota Prehistoric Ceramics. Occasional Publications in Minnesota Anthropology, No. 5. S.F. In: The Minnesota Archaeologist, Vol. 40 (1).

1981c Exploring Iowa's Past. Lynn Marie Alex. University of Iowa Press. Iowa City, Iowa. In: The Wisconsin Archeologist, Vol. 62 (4).

1981d Eastern Iowa Prehistory. Duane Anderson. Iowa State University Press, Ames, Iowa. In: The Wisconsin Archeologist, Vol. 62 (4).

Technical Publications (Contract Archaeology):

1976 An Intensive Inventory, Davenport Iowa, Local Flood Protection Project. Great Lakes Archaeological Research Center Reports of Investigations No. 2. Waukesha.

1976 An Archaeological Inventory of Sanitary Sewer Collection System and Waste Disposal Treatment Facility: Town of Salem Utility District No. 2, Kenosha County. Great Lakes Archaeological Research Center, Reports of Investigations No. 3. Waukesha.

1976 An Archaeological Inventory and Evaluation of the Sheboygan Falls and Kohler Forcemain Routes. Great Lakes Archaeological Research Center Reports of Investigations No. 6. Waukesha.

1976 Archaeological Monitoring and Mitigation, Campground and Trails Development and Rehabilitation, The Apostle Islands National Lakeshore, Stockton Island. Great Lakes Archaeological Research Center Reports of Investigations No. 7. Waukesha.

1976 An Archaeological Survey of The Fennimore, Wisconsin proposed Interceptor Sewer Route and Sewage Treatment Plant Site. Great Lakes Archaeological Research Center Reports of Investigations No. 8. Waukesha.

Technical Publications (Contract Archaeology) Cont'd.

1976 Archaeological Inventory and Evaluation, Walworth County Metropolitan Sewerage District. Great Lakes Archaeological Research Center, Reports of Investigations No. 12. Waukesha.

1977 Archaeological Survey for Fox River Navigation Project Disposal Sites. Great Lakes Archaeological Research Center, Reports of Investigations No. 13. Waukesha.

1977 Cultural Resource Reconnaissance, Five Lake Michigan Harbors. Great Lakes Archaeological Research Center, Reports of Investigations No. 16. Waukesha.

1977 Archaeological Inventory, The Sturtevant Facilities Sturtevant, Wisconsin. Great Lakes Archaeological Research Center No. 18. Waukesha.

1977 Archaeological Inventory and Evaluation: The Proposed Waukesha County Technical Institute Expansion Project. Great Lakes Archaeological Research Center, Reports of Investigations No. 20. Waukesha.

1977 Archaeological Inventory and Evaluation of the Weston Unit 3 Power Plant Site. Great Lakes Archaeological Research Center, Reports of Investigations No. 21. Waukesha.

1977 Archaeological Inventory and Evaluation of Brillion, Wisconsin Wastewater Treatment Plant Facilities. Great Lakes Archaeological Research Center, Reports of Investigations No. 22. Waukesha.

1977 Archaeological Inventory and Evaluation of Butte Des Morts Utility District, Menasha (West). Great Lakes Archaeological Research Center, Inc. Reports of Investigations No. 23. Waukesha.

1977 Partial Inventory of The Eagle Lake Sewer Utility District. Great Lakes Archaeological Research Center, Inc. Reports of Investigations No. 25. Waukesha.

1977 Cultural Resources Reconnaissance, Loves Park, Illinois. Interim 2, Flood Feasibility Study. Great Lakes Archaeological Research Center, Reports of Investigations No. 28. Waukesha.

1977 Cultural Resources Reconnaissance of a Proposed Small Boat Harbor at Green Bay, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 30. Waukesha.

Technical Publications (Contract Archaeology) Cont'd.

1978 Cultural Resource Evaluation of the Sturgeon River Wilderness Study Area, Ottawa National Forest. Great Lakes Archaeological Research Center, Reports of Investigations No. 33. Waukesha.

1978 Cultural Resources Reconnaissance for the Des Moines River Bank Erosion Study. Great Lakes Archaeological Research Center, Reports of Investigations No. 32. Waukesha.

1978 Cultural Resource Evaluation of Two Chequamegon National Forest Wilderness Study Areas: Flynn & Round Lakes. Great Lakes Archaeological Research Center, Reports of Investigations No. 34. Waukesha.

1978 Archaeological Survey in Three Waukesha County Drainage Systems-The Fox, Bark, and Pewaukee Rivers. Great Lakes Archaeological Research Center, Reports of Investigations No. 35. Waukesha.

1978 Archaeological Inventory and Evaluation of The Proposed Wastewater Treatment Plant Facilities, Fond Du Lac County, Wisconsin. Great Lakes Archaeological Research Center Reports of Investigations No. 36. Waukesha.

1978 Archaeological Survey of Proposed Construction Areas in The Horicon National Wildlife Refuge. Great Lakes Archaeological Research Center, Reports of Investigations No. 39. Waukesha.

1979 Cultural Resources Overview of The Chequamegon National Forest. Great Lakes Archaeological Research Center, Reports of Investigations No. 50. Waukesha.

1979 Archaeological Recovery at 11 Ri 337, An Early Middle Woodland Shell Midden in East Moline, Illinois. Great Lakes Archaeological Research Center, Reports of Investigations No. 60. Waukesha.

1979 Archaeological Survey and Test Excavations in The Fox River Drainage-- Waukesha, Racine, and Kenosha Counties. Great Lakes Archaeological Research Center, Reports of Investigations No. 67. Waukesha.

1979 Archaeological Studies at the Mile-Long Site (47 Wl 110), A Planning and Preservation Report. Great Lakes Archaeological Research Center, Reports of Investigations No. 70. Waukesha.

1979 Archaeological Inventory: Proposed Oshkosh Area Sanitary System. Great Lakes Archaeological Research Center, Reports of Investigations No. 72. Waukesha.

Technical Publications (Contract Archaeology) Cont'd.

1979 Archaeological Survey of the Proposed Packerland Industrial Park Post Office Site. Green Bay, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 78. Waukesha.

1979 Archaeological Evaluation of the Proposed Madison Area Technical College at the Burke Site, Madison, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 81. Waukesha.

1979 Archaeological Survey of The East Shore of Lake Winnebago, 1979. Great Lakes Archaeological Research Center, Reports of Investigations No. 86. Waukesha.

1979 Archaeological Survey of The Green Bay Coastal Corridor. Great Lakes Archaeological Research Center, Reports of Investigations No. 87. Waukesha.

1980 Archaeological Inventory of the Proposed Interceptor Sewer at the City of Mayville, Dodge County, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 91. Waukesha.

1980 Archaeological Survey of Two Proposed Dredge Disposal Sites at the Sturgeon Bay Ship Canal. Great Lakes Archaeological Research Center, Reports of Investigations No. 92. Waukesha.

1980 Archaeological Inventory of a Proposed Development Site at the Intersection of U.S. Highways 41 and 10 near Appleton, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 96. Waukesha.

1980 Archaeological Investigations at Jim Falls, Chippewa County, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 99. Waukesha.

1981 Archaeological Survey of the East Shore of Lake Winnebago: 1980-81. Great Lakes Archaeological Research Center, Reports of Investigation No. 100. Waukesha.

1981 Archaeological Inventory and Evaluation of the Exxon Minerals Company Crandon Project Site, Forest and Langlade counties, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 107. Waukesha.

1981 Archaeological Reconnaissance of Lewiston and Portage Levees, Portage, Wisconsin. Great Lakes Archaeological Research Center, Reports of Investigations No. 108.

1981 Identification and Evaluation of Logging Industry-Related Cultural Resources, Nicolet National Forest. Great Lakes Archaeological Research Center, Reports of Investigations No. 114. Waukesha.

1981a Preliminary Investigations: Archaeology and Sediment Geomorphology, Navigation Pool 12, Upper Mississippi River. Great Lakes Archaeological Research Center, Reports of Investigations No. 115.

Archaeological Field Experience:

Fourteen years of field experience in Wisconsin, Illinois, Iowa, Michigan, and Minnesota.

Grants and Honors:

1971 The Wisconsin Archaeological Society. Dissertation research at the Pipe Site, Pipe, Wisconsin.

1971 Academic Dean's nominee as National Candidate for Woodrow Wilson Dissertation Support Fellowship.

1972 The Wisconsin Archaeological Society. Dissertation research at the Pipe Site, Pipe, Wisconsin. University of Wisconsin-Milwaukee Graduate School Fellowship.

1974 Appointed Logan Fellow, Logan Museum of Anthropology, Beloit College (appointment declined).

1975 Appointed Research Associate, Logan Museum of Anthropology, Beloit College.

1976 Title VI-A Grant to establish comparative teaching collection in Anthropology, University of Wisconsin - Waukesha.

1977 Historic Site Survey Grant from National Advisory Council on Historic Preservation. Administered by The State Historical Society of Wisconsin, Historic Preservation Division.

1978 Historic Site Survey Grant from National Advisory Council on Historic Preservation. Administered by The State Historical Society of Wisconsin, Historic Preservation Division.

1978 Archaeological Survey Grant from National Oceanic and Atmospheric Administration--Coastal Zone Management Program. Administered by the State Historical Society of Wisconsin and Wisconsin Department of Administration.

1979 Historic Site Survey Grant from National Advisory Council on Historic Preservation. Administered by The State Historical Society of Wisconsin, Historic Preservation Division.

1979 Zieman Foundation. Grant for printing subsidy for The Wisconsin Archeologist.

1979 Helfaer Foundation. Grant for printing subsidy for The Wisconsin Archeologist.

1979 Awarded the Increase A. Lapham Research Medal for distinguished research in Anthropology. The Wisconsin Archeological society.

1979 Awarded the Robert E. Ritzenthaler service award, The Wisconsin Archeological Society.

1980 Grant from the Rock Island District, U.S. Army Corps of Engineers for printing subsidy for The Wisconsin Archeologist.

1980 Grant from the Grootemaat Foundation for printing subsidy for The Wisconsin Archeologist.

1980 Grant from the Helfaer Foundation for printing subsidy for The Wisconsin Archeologist.

1980 Grant from the Zieman Foundation for printing subsidy for The Wisconsin Archeologist.

1981 Grant from the Zieman Foundation for hardware and software for production of The Wisconsin Archeologist

Employment History:

Military service: U.S. Army, honorably discharged, July 1963.

1969-1971 Teaching Assistant in Anthropology, Department of Anthropology, University of Wisconsin-Milwaukee.

1973 Lecturer in Anthropolgy, Marquette University.

1974 Lecturer in Anthropolgy, University of Wisconsin-Milwaukee.

1972-1981 Associate Professor of Anthropology (tenure), The University of Wisconsin-Waukesha.

1975-1982 Director, Great Lakes Archaeological Research Center, Inc., Waukesha, WI.

University Courses Taught:

Introduction to Cultural Anthropology
General Anthropology
Introduction to Physical Anthropology
Intermediate Sociocultural Analysis
Human Evolution and Variation
Survey World Prehistory--Origins of Civilization
Survey of World Ethnography
Methods and Techniques in Archaeology*
Wisconsin Prehistory
Comparative Religion
Field Archaeology--Survey and Excavation
Analyses of Archaeological Materials and Data
Hominid Paleontology
North American Prehistory
North American Indians
Indians of The Western Great Lakes

Adult Education Courses Taught:

Site Survey in Archaeology, University of Wisconsin Extension.
Map Making and survey techniques in Archaeology, University of Wisconsin Extension.
Field Methods in Archaeology, University of Wisconsin Extension.

JOAN E. UNDERWOOD
Hydrogeologist

EDUCATION:

M.S. - Hydrology, University of Idaho,
Moscow, Idaho - 1981

B.S. - Geology, University of Wisconsin-Oshkosh,
Oshkosh, Wisconsin - 1978

EMPLOYMENT HISTORY:

1982 - Present	Donohue & Associates, Inc.
1980 - 1982	Private Consultant
1981 - 1982	University of Wisconsin-Oshkosh
1980 - 1981	Williams-Robinette and Associates, Inc.

AREAS OF SPECIALTY:

Geophysical Studies
Hydrogeologic Studies
Groundwater Contamination

EXPERIENCE:

* Hydrogeologic study using electrical resistivity to determine the extent of groundwater contamination caused by waste disposal in Jamaica.

* Geological study using ground-penetrating radar to delimit ore deposits in Jamaica.

* Archaeological study using ground-penetrating radar to locate potential archaeological site at New Seville, Jamaica.

* Geologic reconnaisance for an ash disposal site using electrical resistivity to determine depth to bedrock and estimated amount of fine grained soils near Wausau.

* Field geologist for hydrogeologic study to determine groundwater flow characteristics and contaminant migration at the Joliet Army Ammunition Plant.

* Hydrogeologic study for confidential client to determine extent and source of groundwater contamination and groundwater flow characteristics in the water table aquifer. Responsibilities included well placement and design, determining aquifer characteristics through pump tests, and groundwater modeling.

* GPR demonstration to determine the response and application of GPR for landfill siting.

* Hydrogeologic reconnaissance study to determine municipal water supply potential near Norway, Michigan.

* Surface geophysical and hydrologic study to define potential groundwater producing zones for irrigation wells near Frenchglen, Oregon.

* Field director for surface geophysical and hydrologic study to determine possible groundwater contamination from hazardous waste disposal at nine sites in West Virginia.

* Determination of groundwater supply potential for domestic wells near Moscow, Idaho.

* Analysis and comparison of laboratory chemical and resistivity data with field resistivity data for the calibration of resistivity equipment.

* Conducted surface geophysical study on a tailings impoundment to determine if direct current electrical surveying could delineate the water table in the embankment for the U.S. Bureau of Mines, Spokane Mining Research Section.

* Designed and conducted the Idaho Surface Impoundment Assessment to inventory all waste disposal storage and treatment surface impoundments in mining, industrial, municipal, and agricultural activities. Evaluations were conducted as to the groundwater and surface water contamination potential of the impoundments.

* Field director for a resistivity study to delineate contacts between basalt flows and lake sediments forming the Snake Plain Aquifer near Blackfoot, Idaho, for the Department of Interior, Water, and Power Resources Division.

* Conducted surface geophysical reconnaissance study for detecting groundwater contamination from uranium waste disposal at depth (50-200 meters) at the Dawn Tailings disposal site, Ford, Washington.

MEMBERSHIPS:

Society of Exploration Geophysicists

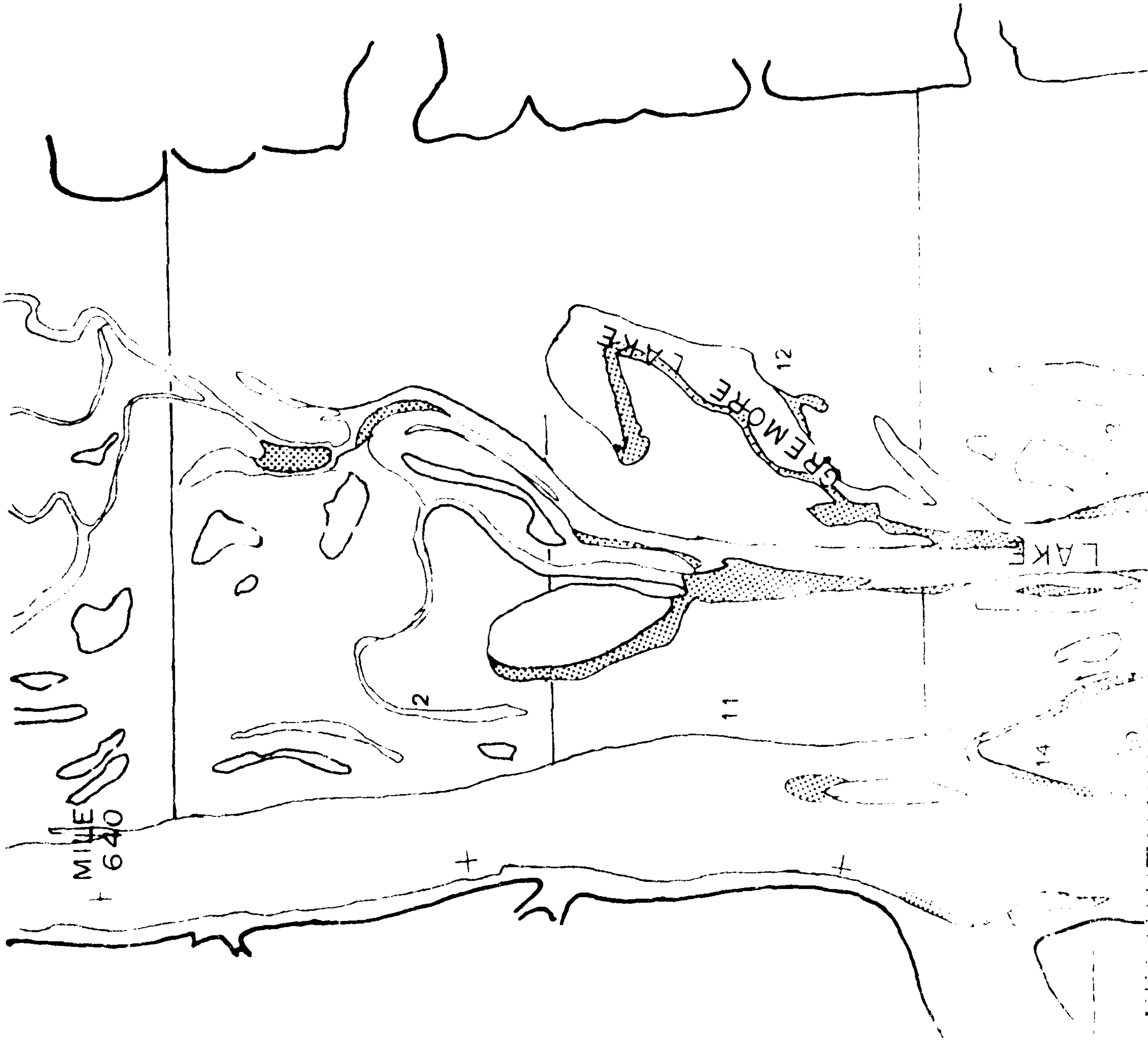
PRESENTATIONS AND PUBLICATIONS:

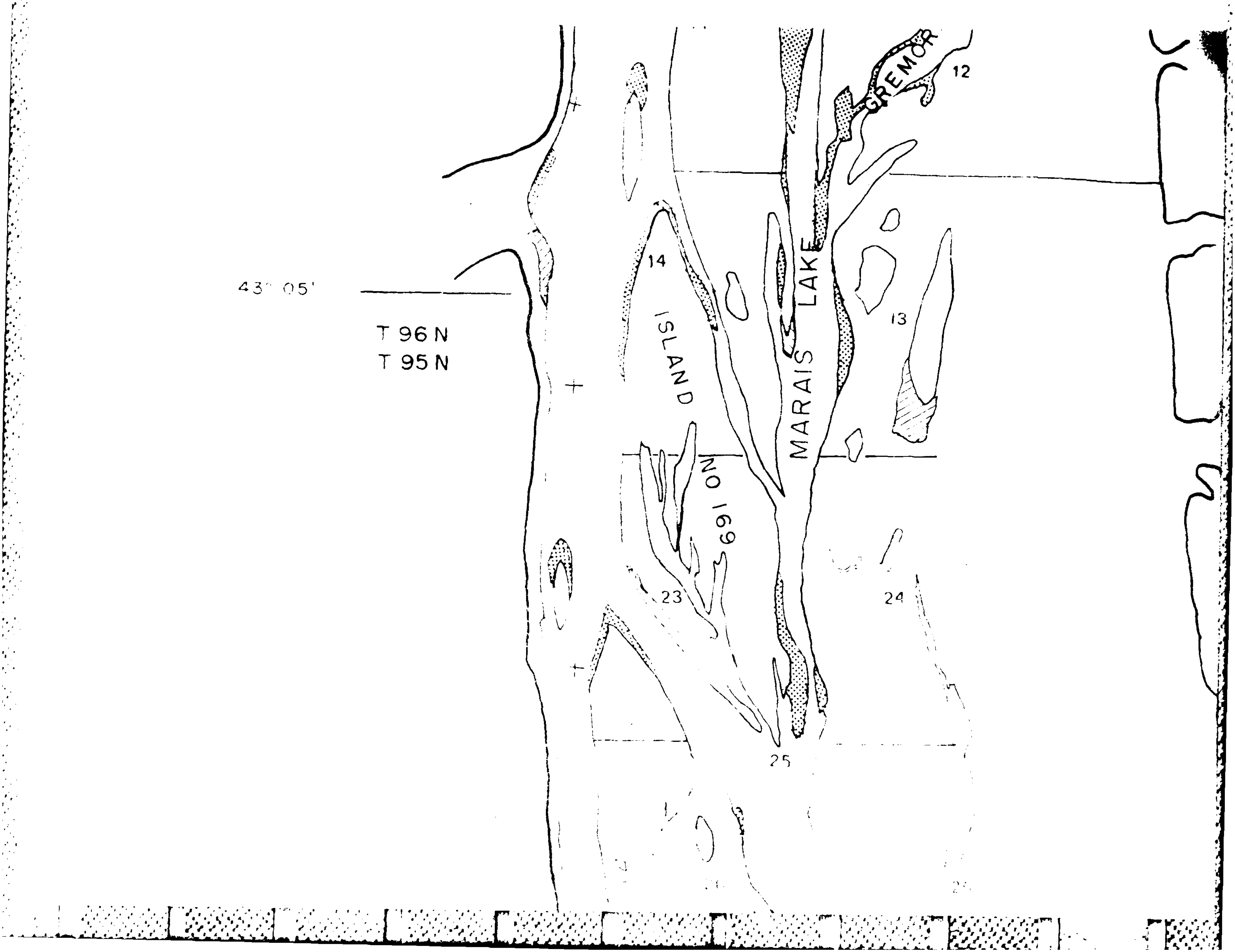
"Assessment of Groundwater Contamination from Surface Impoundments in Idaho," coauthored with M. Robinette. Proceedings from the Eighteenth Annual Engineering Geology and Soils Engineering Symposium, Boise, Idaho.

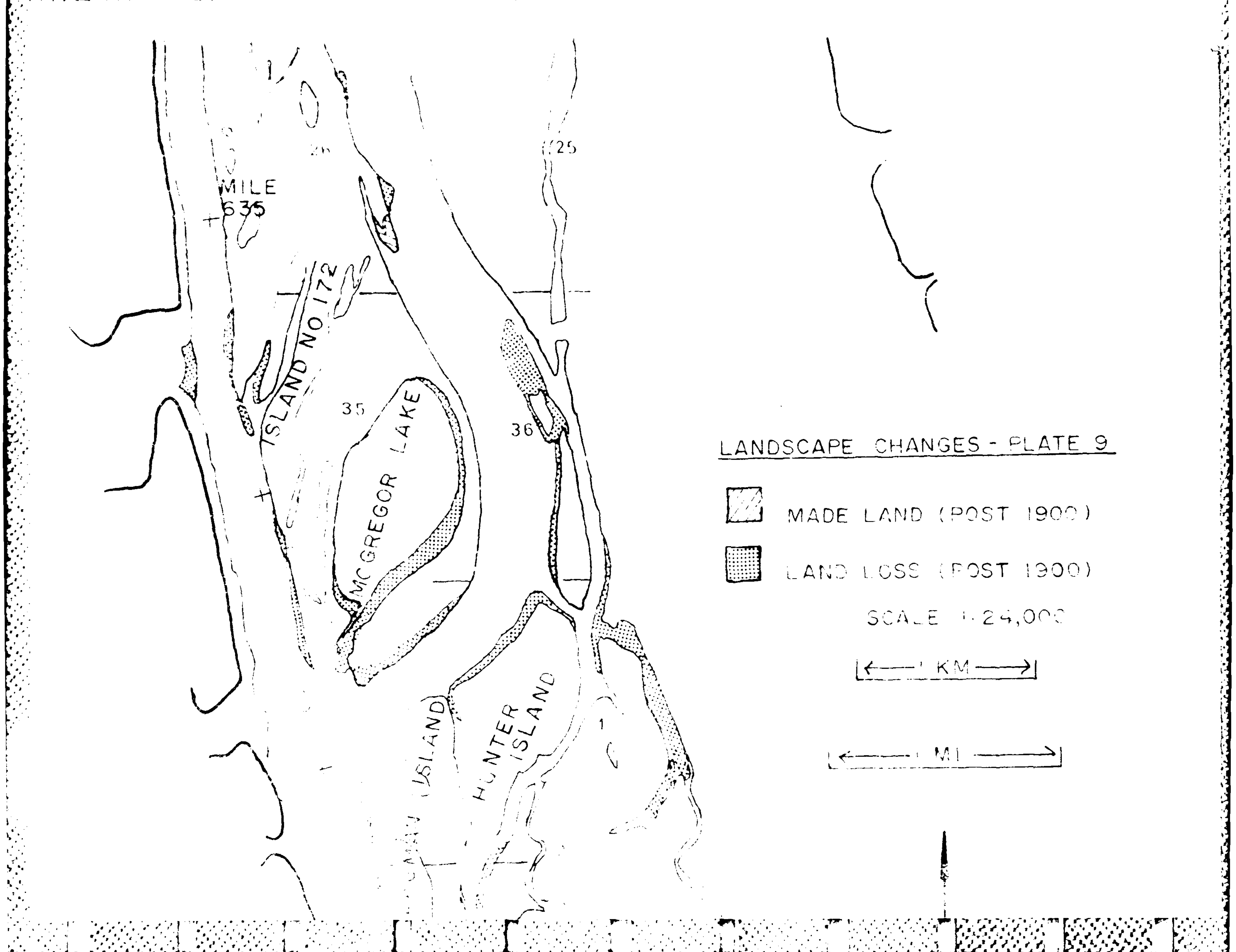
"Geoelectric Investigations at the ASARCO Tailings Impoundment, Osburn, Idaho," coauthored with M. Robinette, Idaho Mining and Minerals Resources Research Institute, Final Report to the U.S. Bureau of Mines, 1981.

"Electrical Resistivity Investigations at the Dawn Tailings Disposal Site, Ford, Washington," coauthored with M. Robinette and R. Williams (advisory capacity), 1980.

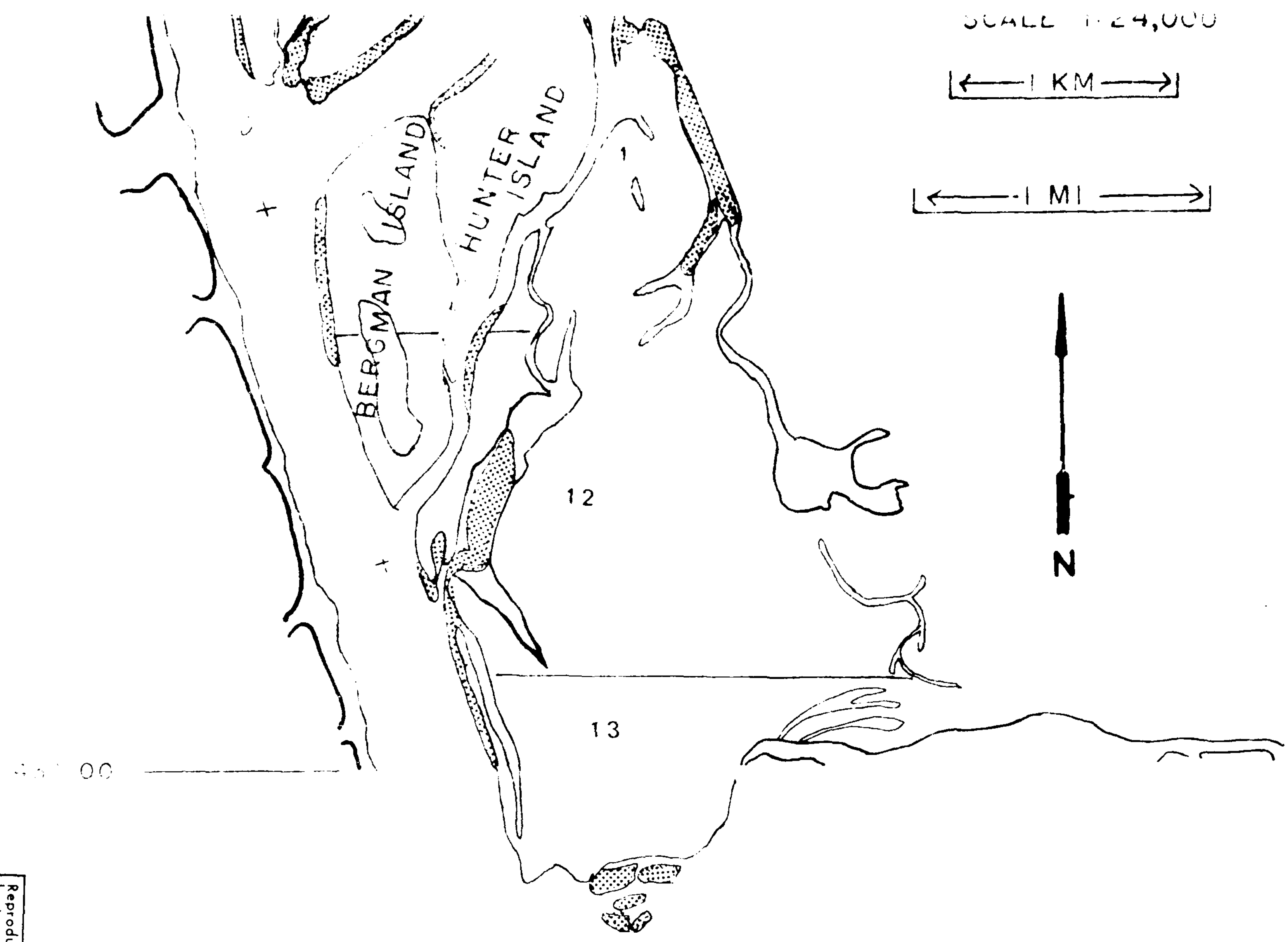
"Resistivity and Seismic Investigation Near Norway, Michigan, for a Municipal Water Supply" coauthored with C.J. Laudon and T.F. Laudon. Proceedings from the American Water Resources Association, Wisconsin Section, Seventh Annual Meeting, 1983.

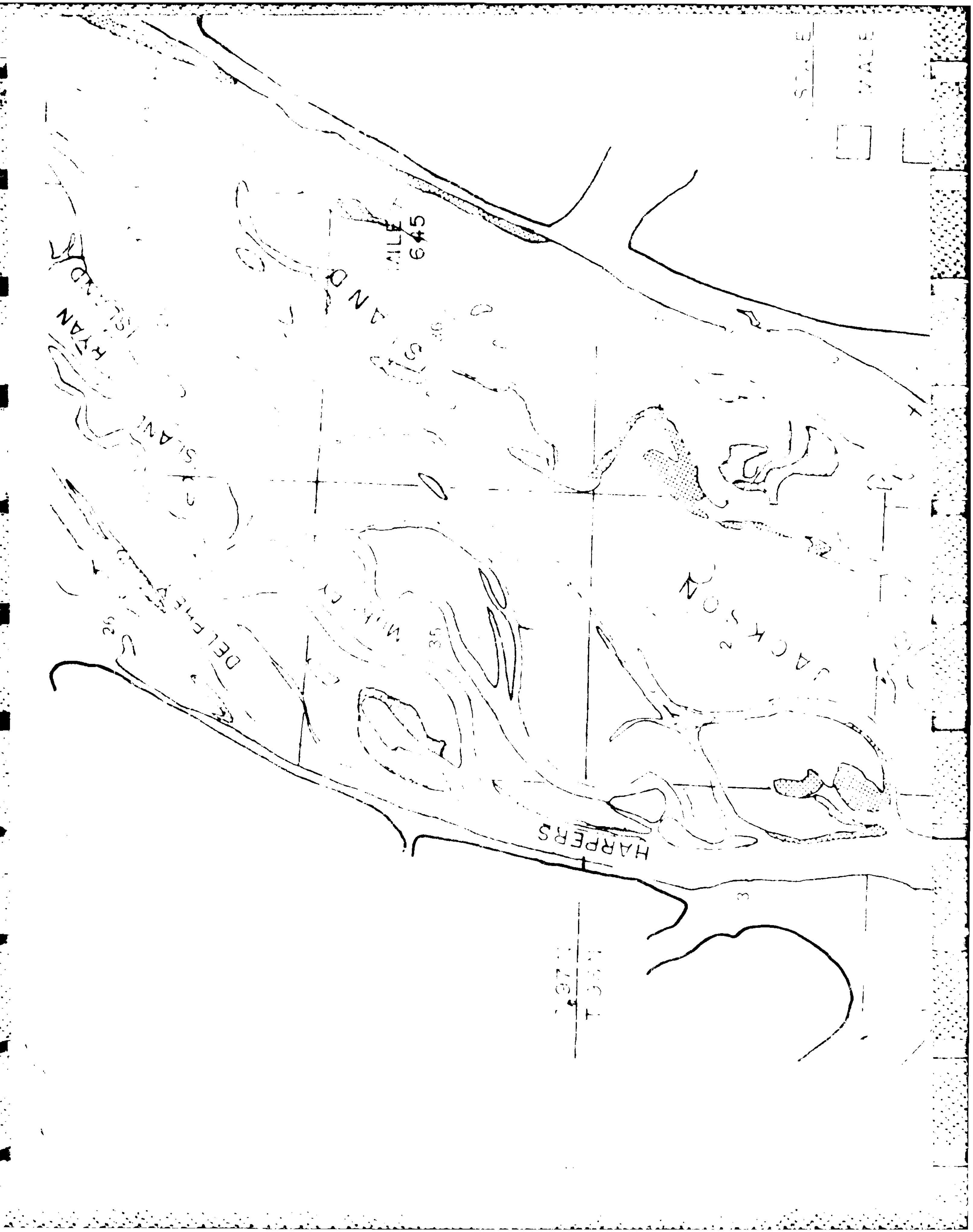

MILE
640
GREMORE LAKE
LAKE
12
2
11
14


GREMOR
12
13
14
LAKE
MARAIS
ISLAND
NO 169
23
24
25
43° 05'
T 96 N
T 95 N

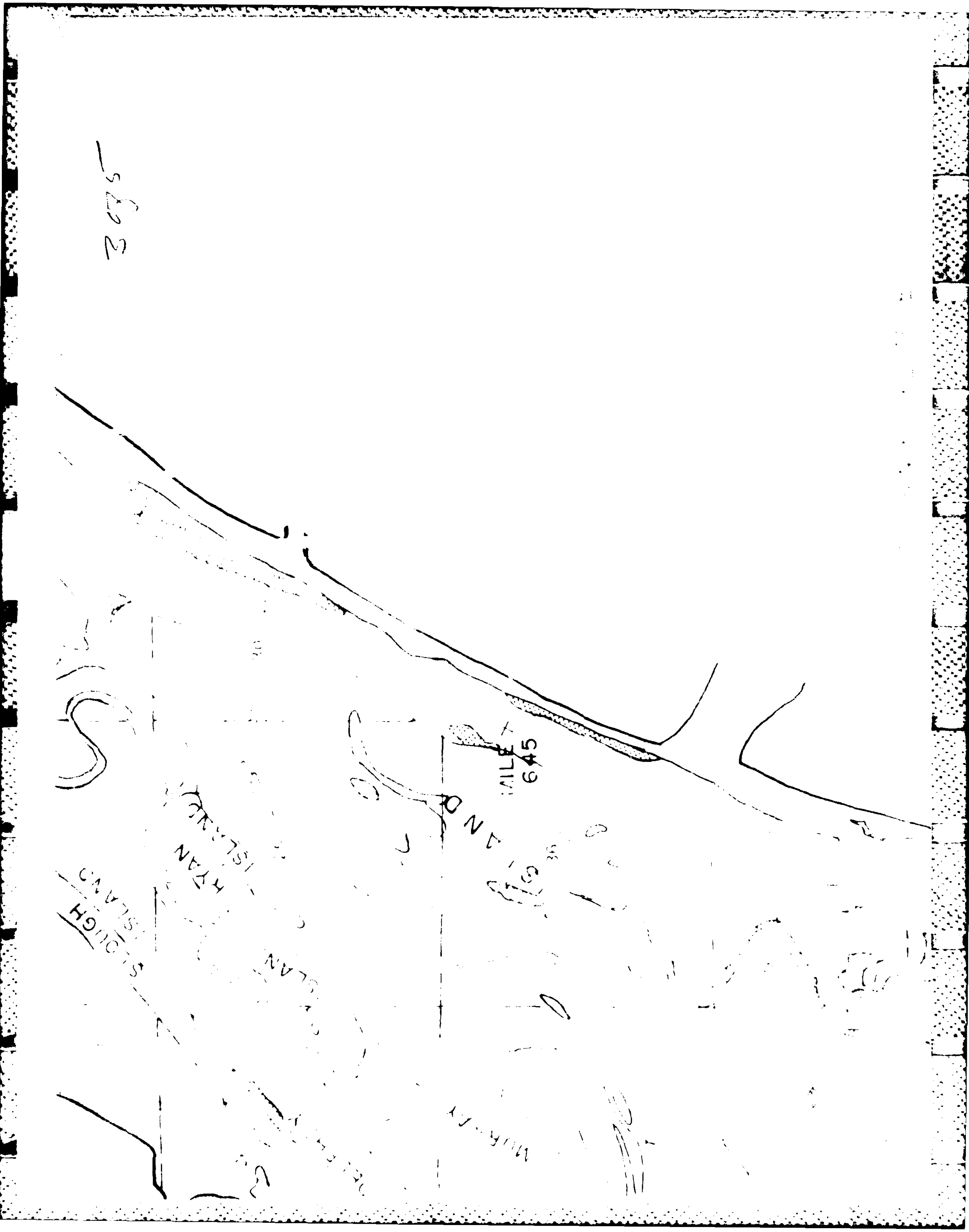


LANDSCAPE CHANGES - PLATE 9
MADE LAND (POST 1900)
LAND LOSS (POST 1900)
SCALE 1:24,000
1 KM
1 MI
MILE 635
ISLAND NO 172
MC GREGOR LAKE
HUNTER ISLAND
ISLAND
35
36
25
26


SCALE 1:24,000
1 KM
1 MI
N
BERGMAN ISLAND
HUNTER ISLAND
12
13

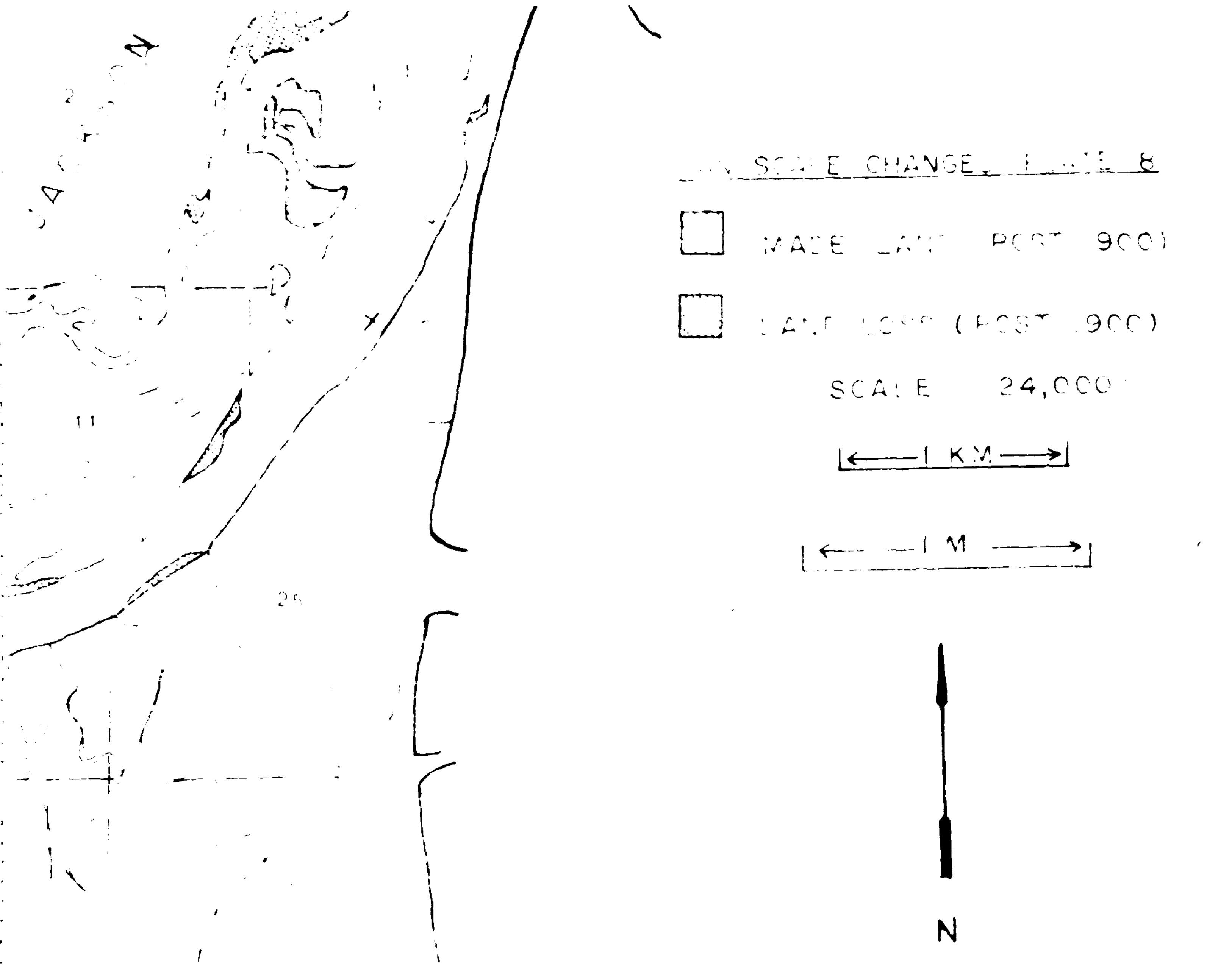


HARPERS
JACKSON
MILE
645
RYAN



MILE 645
RYAN
ISLAND
SLOUGH

JACKSON
HARPER
3
10
11
25
26
35
36



595


MILE 640
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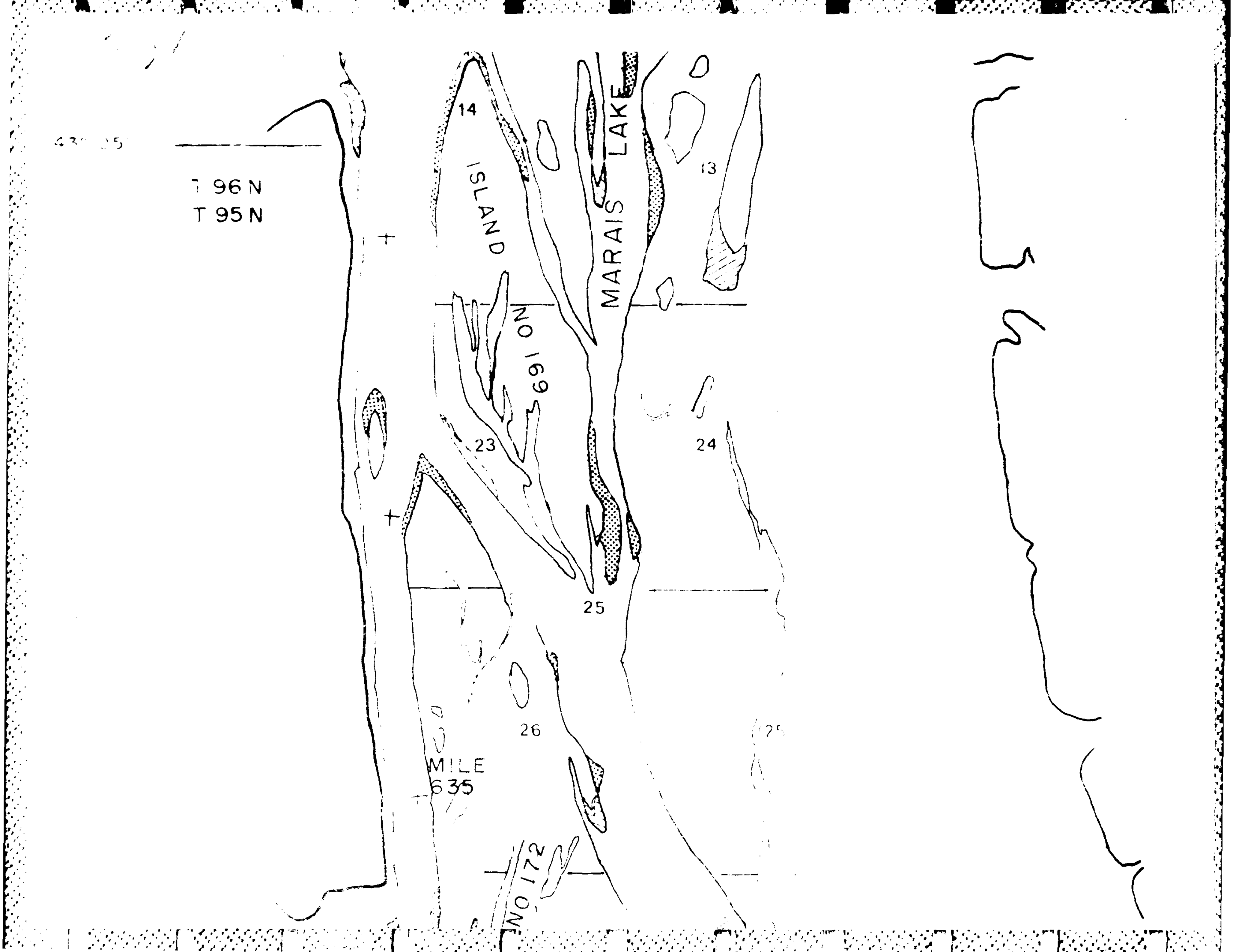
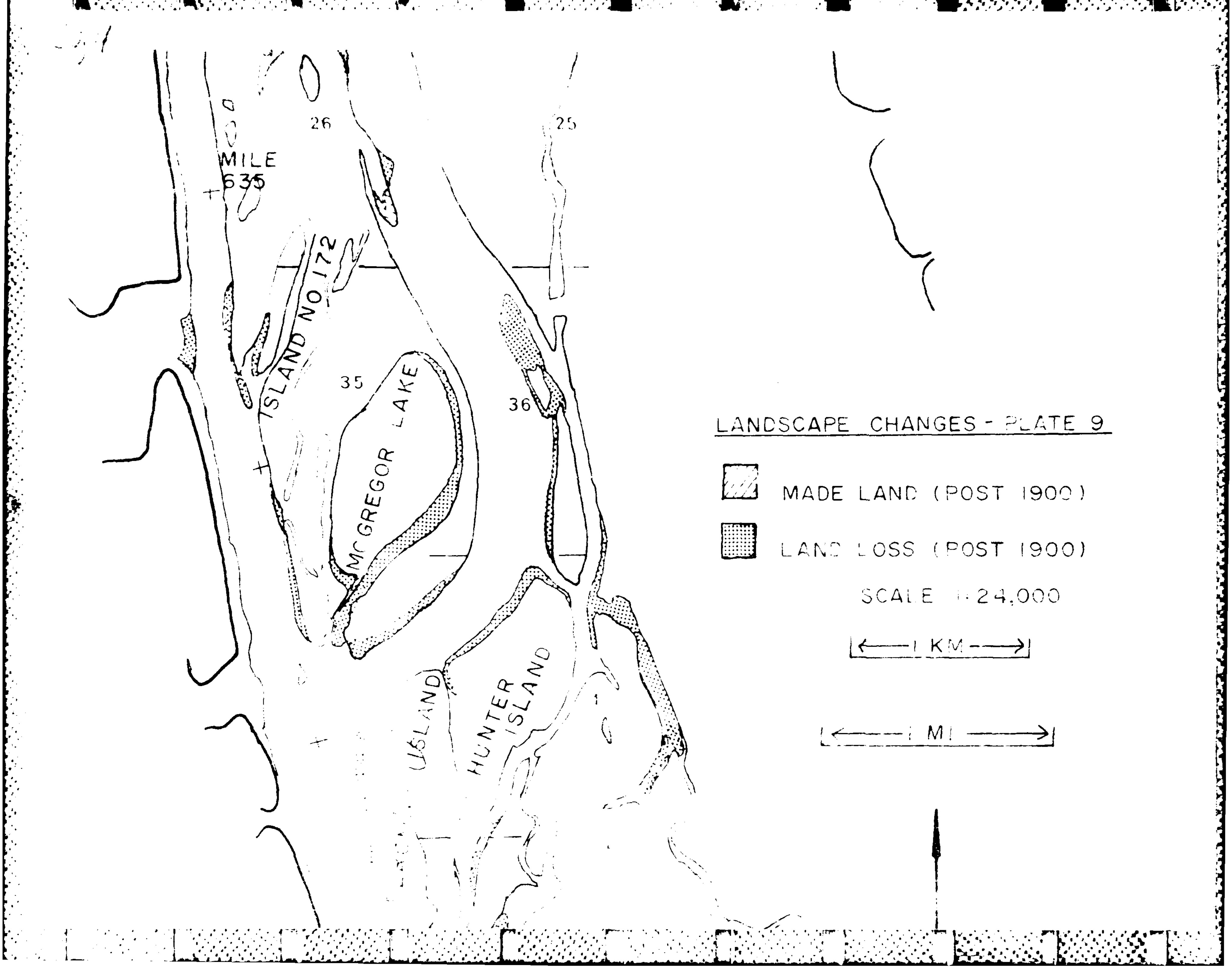
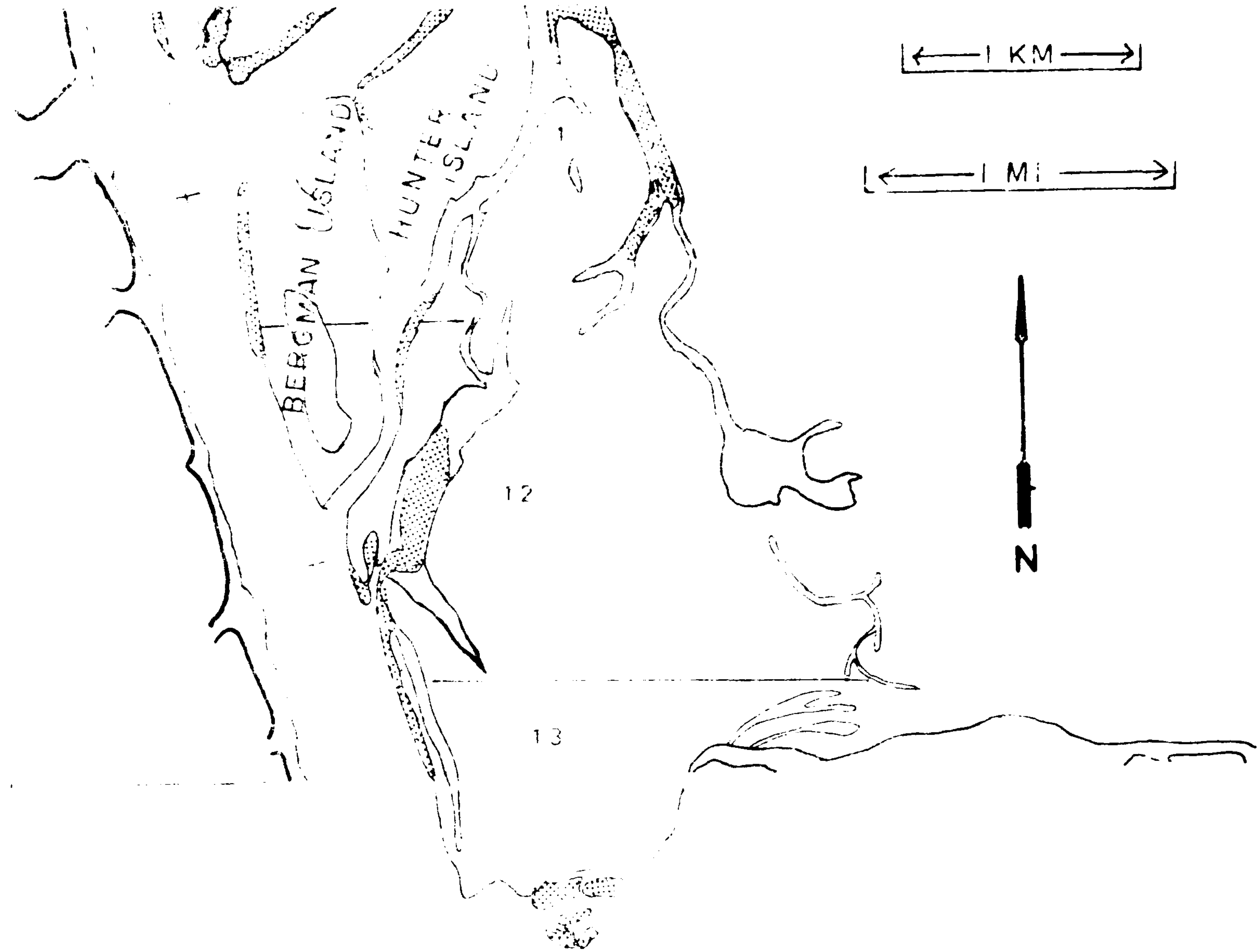
11
2


T 96 N
T 95 N
14
ISLAND
NO 169
MARAIS
LAKE
13
23
24
25
26
MILE
635
NO 172


LANDSCAPE CHANGES - PLATE 9
MADE LAND (POST 1900)
LAND LOSS (POST 1900)
SCALE 1:24,000
1 KM
1 MI
MILE 635
26
25
ISLAND NO 172
35
36
McGREGOR LAKE
HUNTER ISLAND
ISLAND


1 KM
1 Mi
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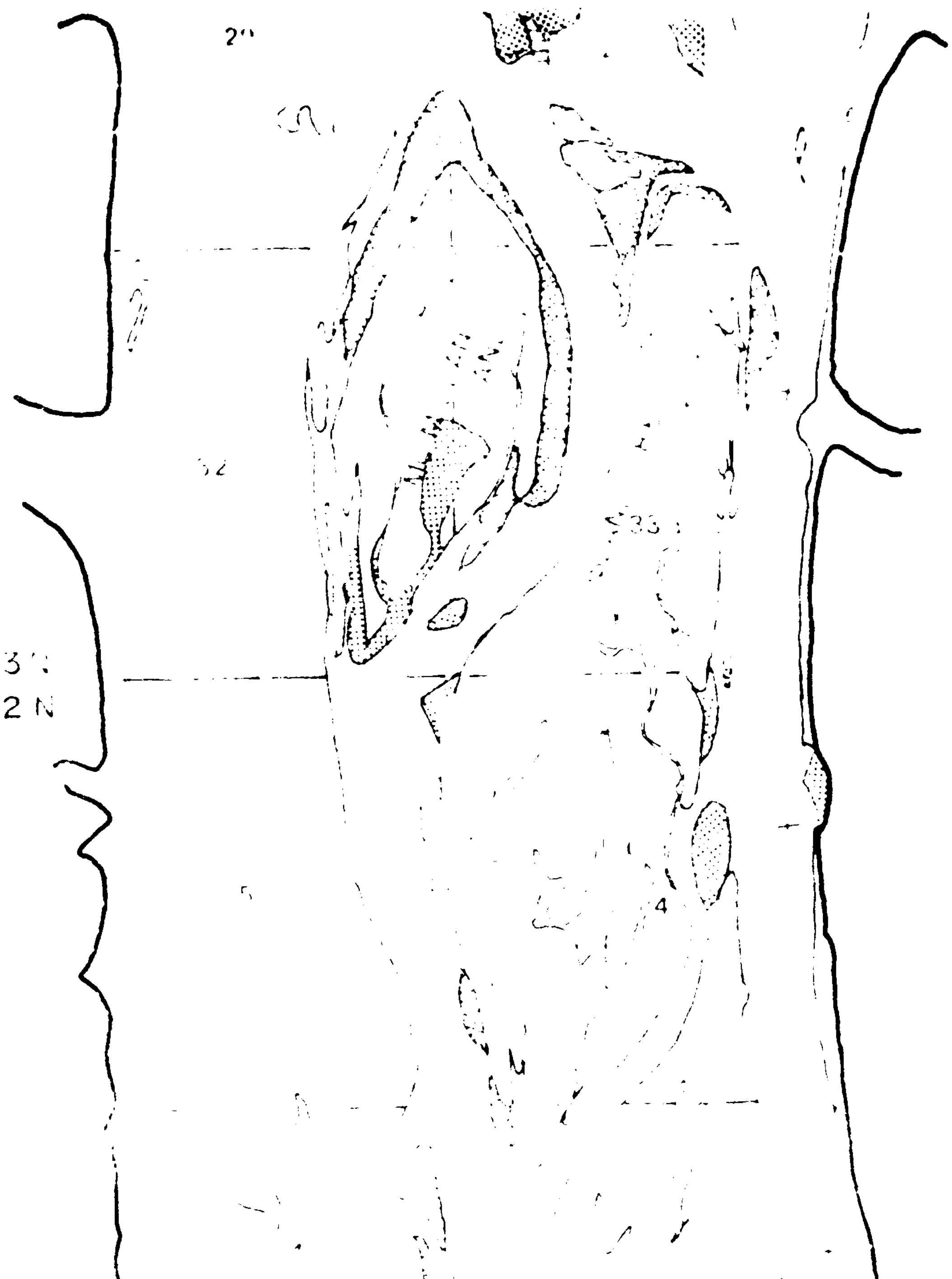
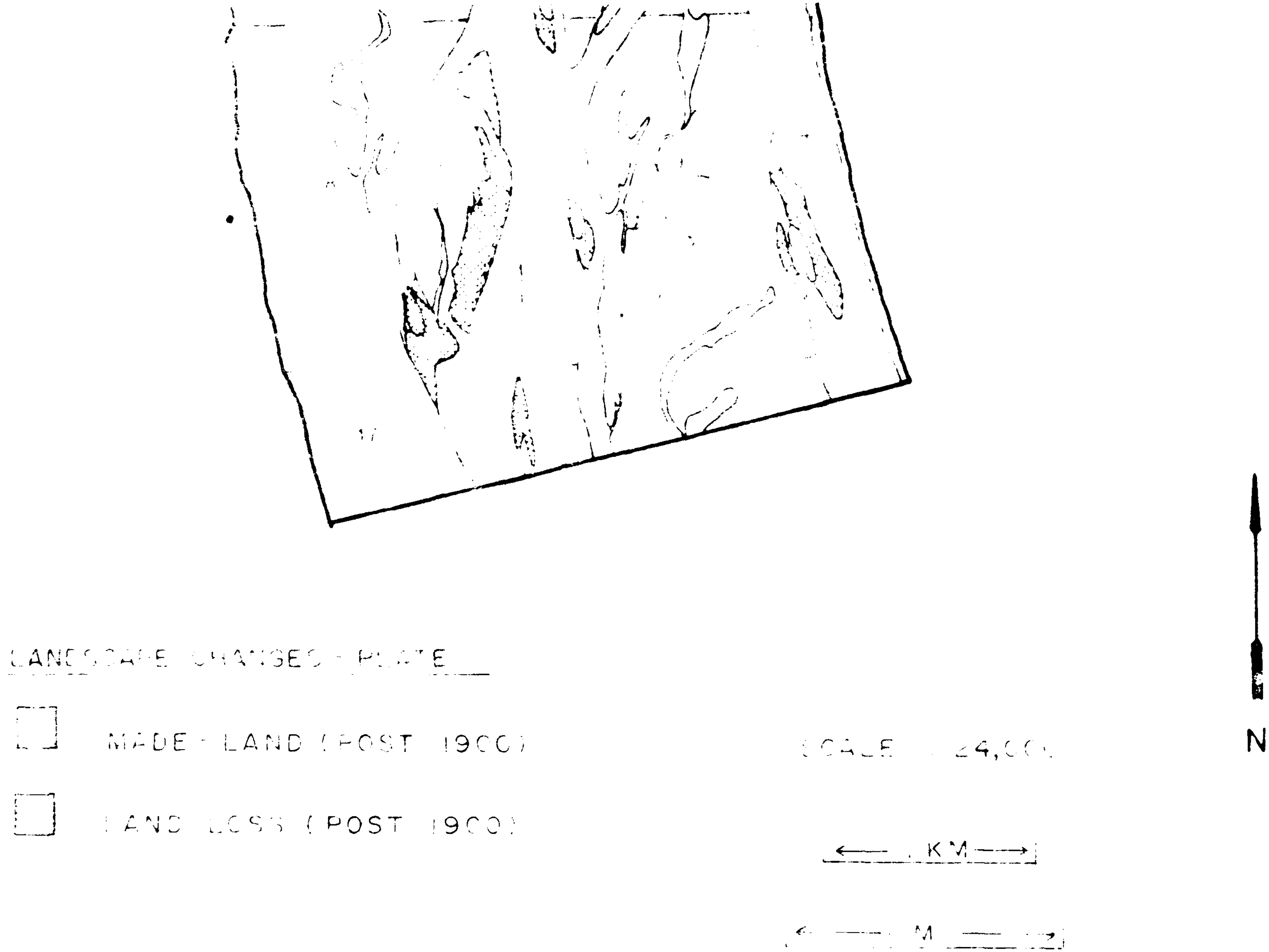
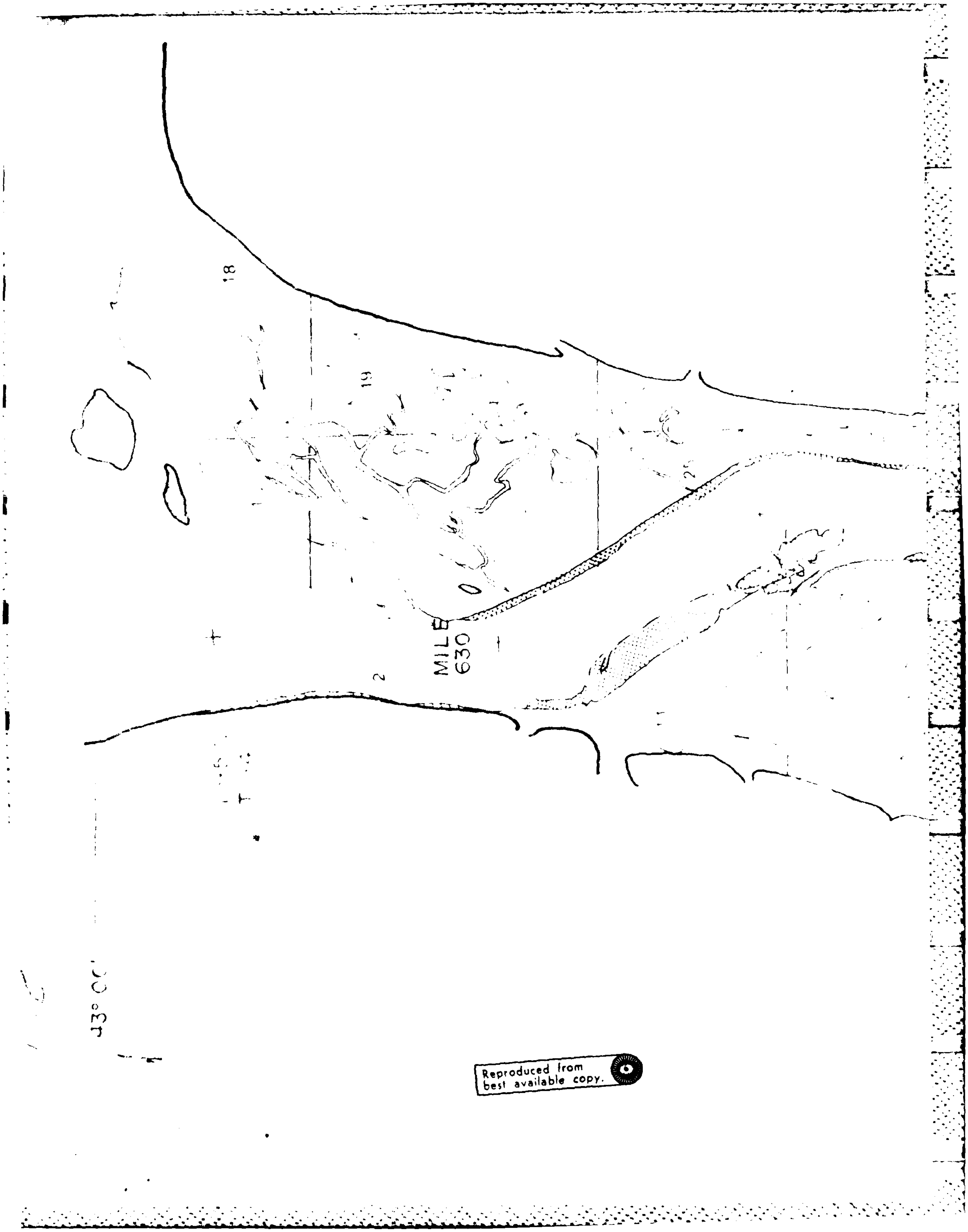
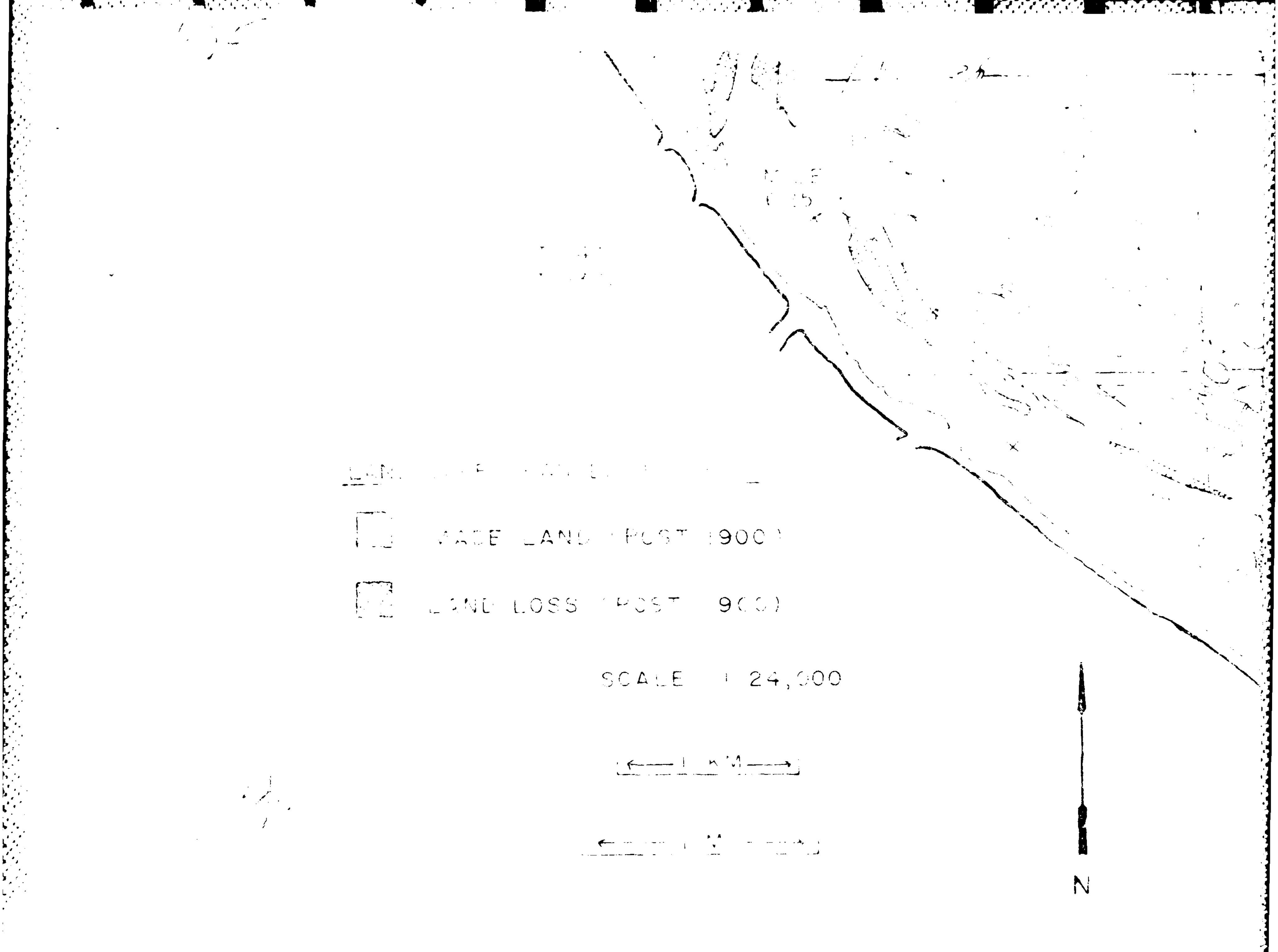
BERGMAN ISLAND
HUNTER ISLAND
12
13


T 93 N
T 92 N


N
LANDSCAPE CHANGES - PLATE
MADE LAND (POST 1900)
LAND LOSS (POST 1900)
SCALE
KM
M

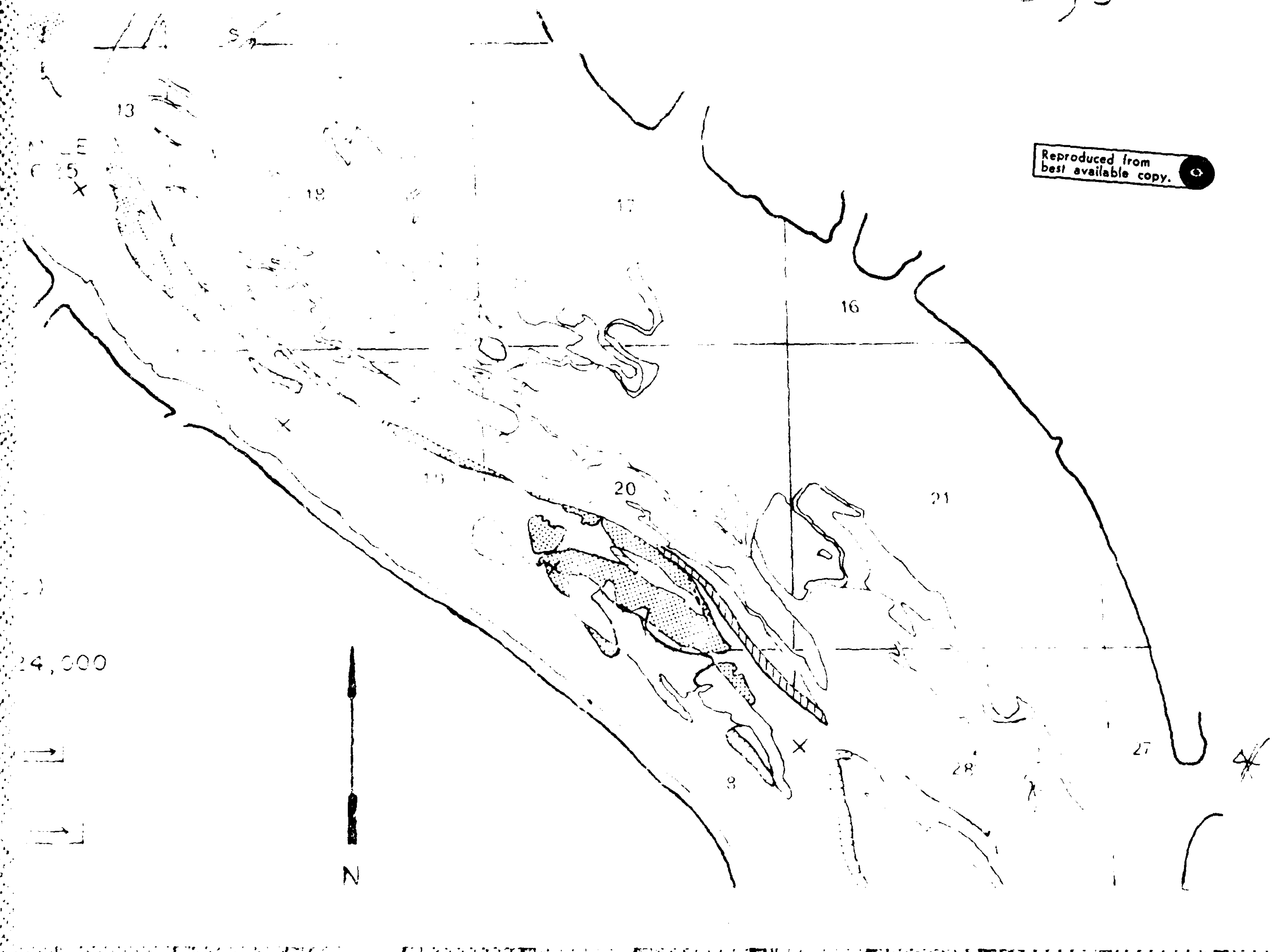

18
19
MILE
630
43° 00'


124
125

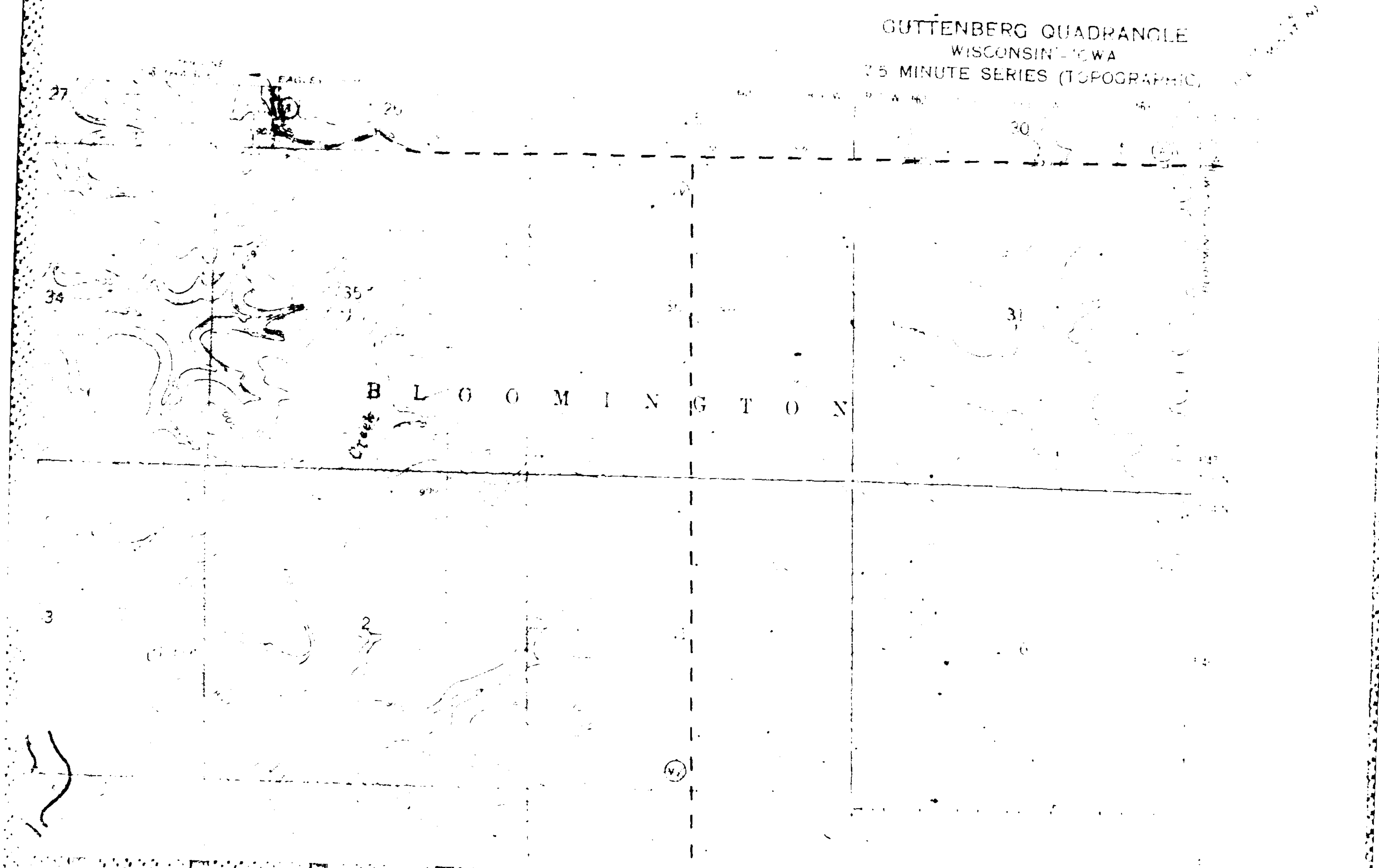


MADE LAND (POST 1900)
LAND LOSS (POST 1900)
SCALE 1:24,000
N

535

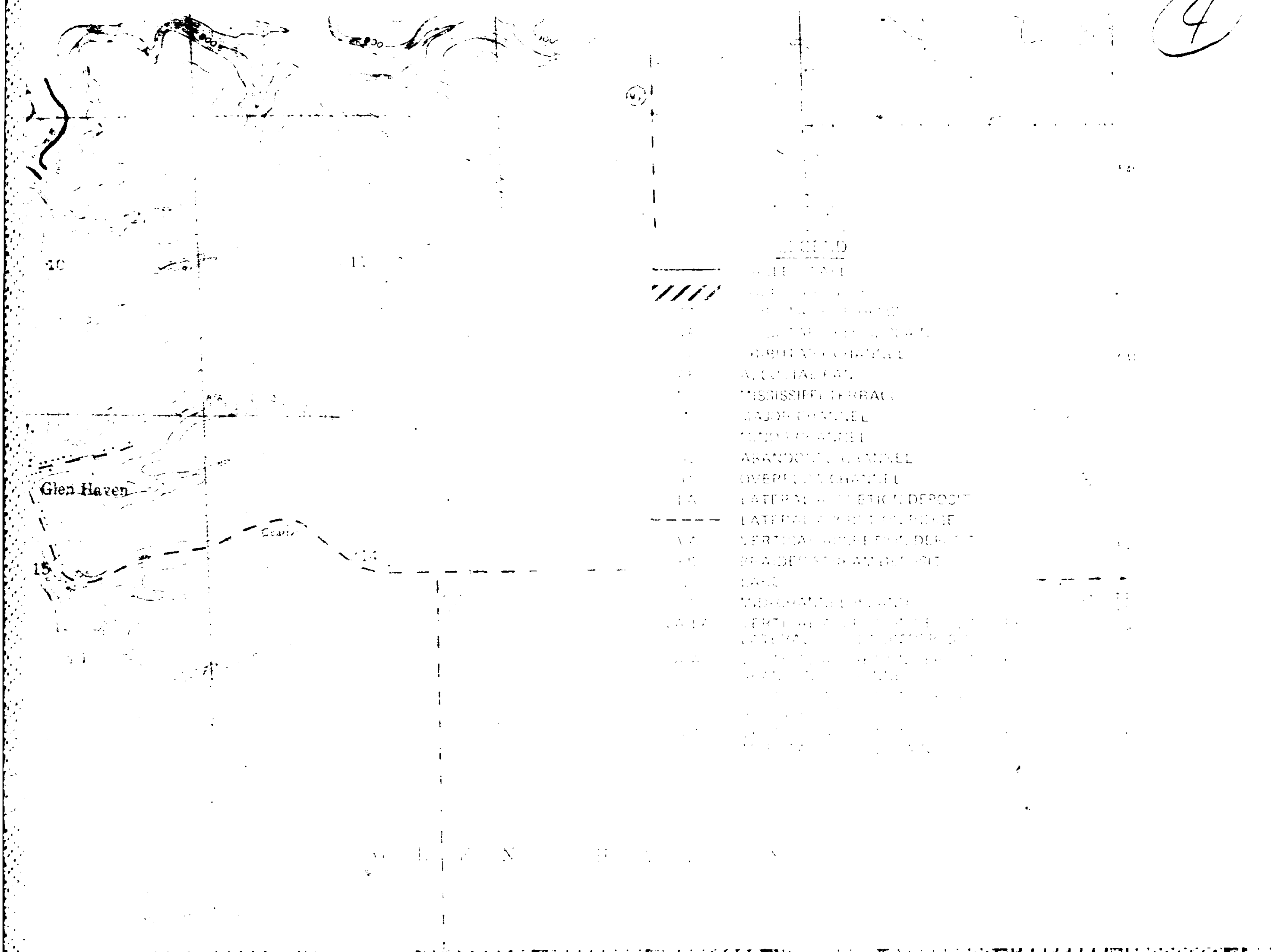


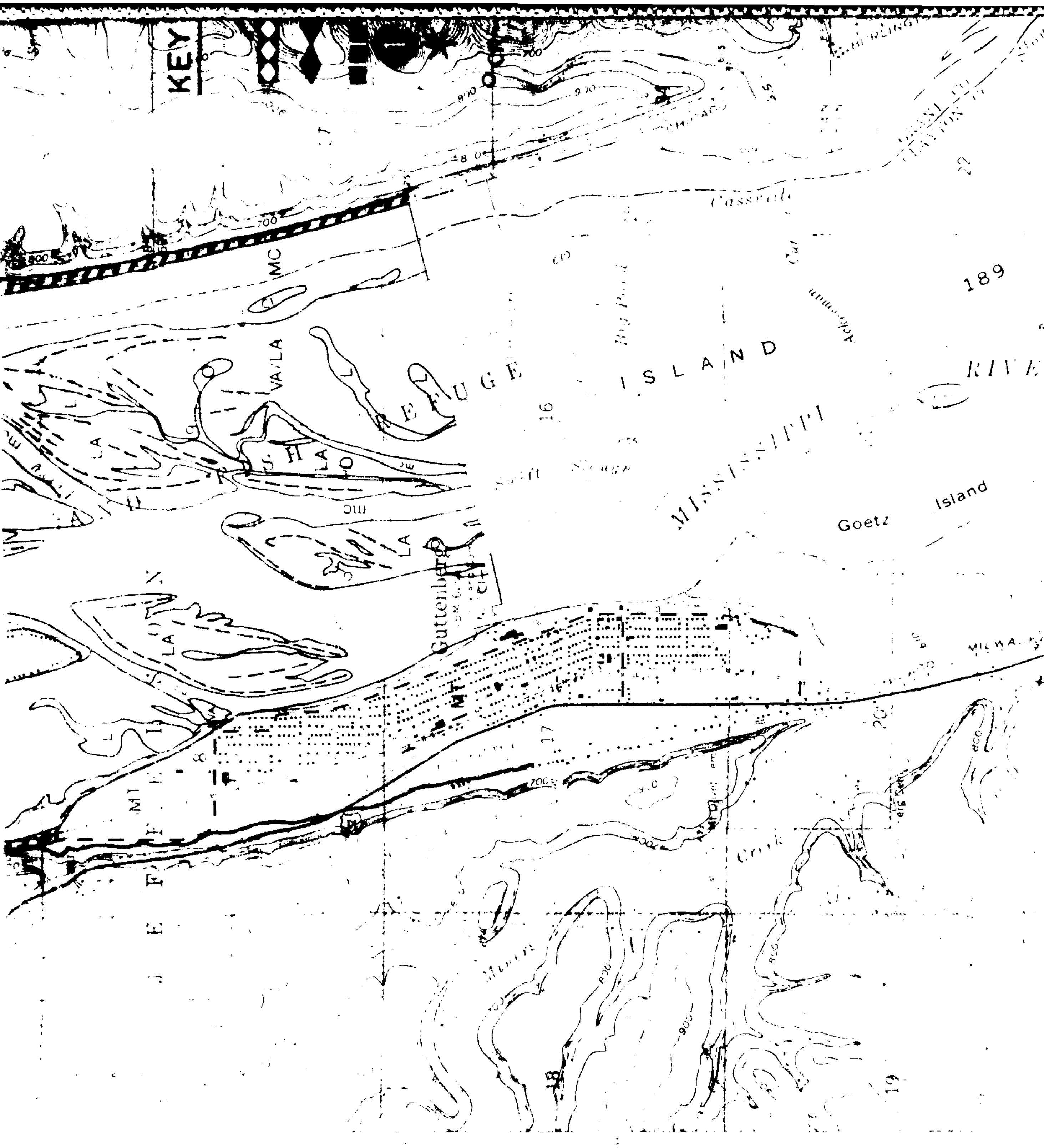

Island


GUTTENBERG QUADRANGLE
WISCONSIN-IOWA
7.5 MINUTE SERIES (TOPOGRAPHIC)
27
34
35
30
31
3
2
6
BLOOMINGTON
Creek

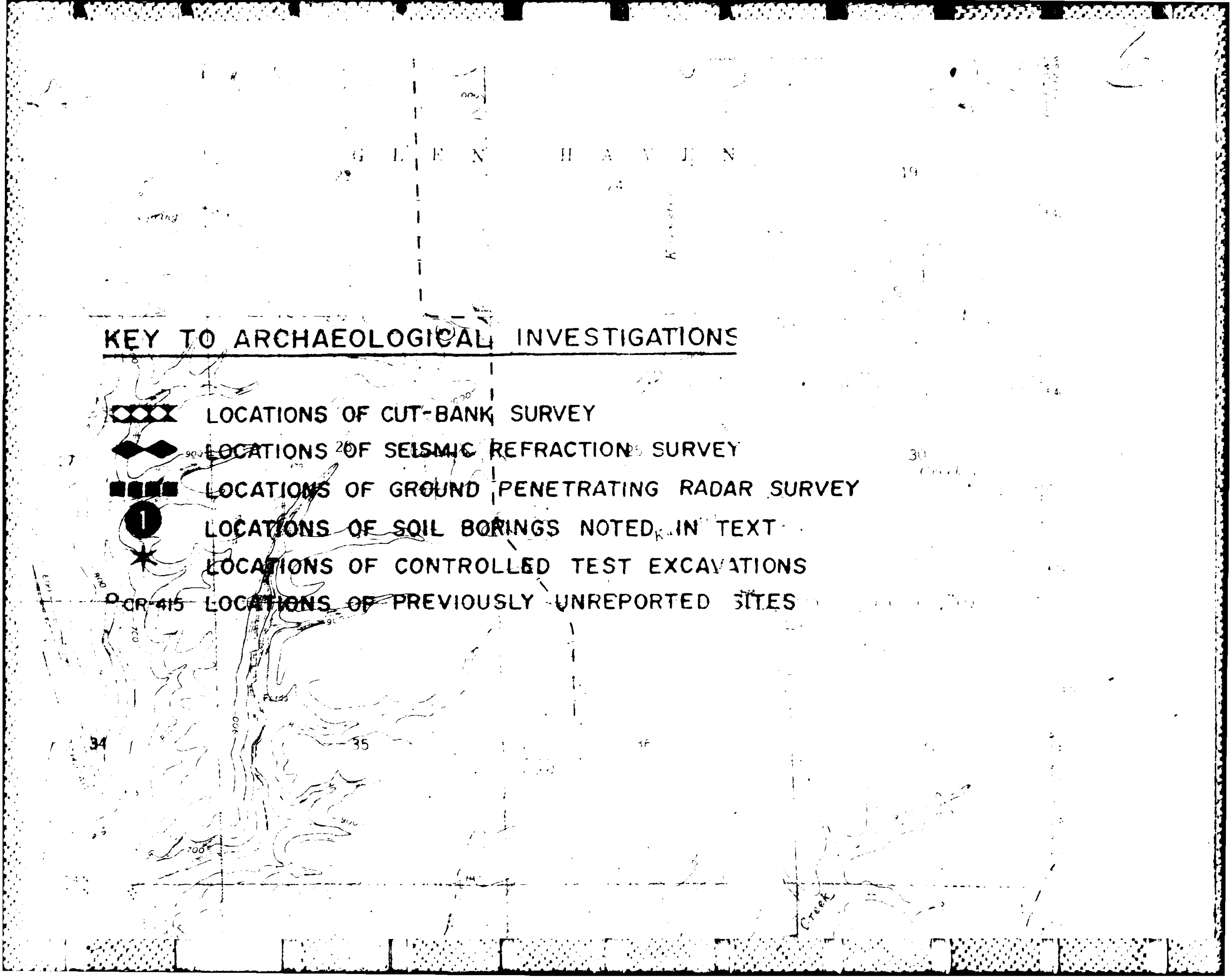
Glen Haven
15
AF
AFI
VA/TF
MT
MC
LA
TT
KE

(4)





KEY
189
ISLAND
REFUGE
MISSISSIPPI
RIVE
Goetz Island
Guttenberg
MILWAU
Cassville
Swift Slough
Creek


GLEN HAVEN
KEY TO ARCHAEOLOGICAL INVESTIGATIONS
LOCATIONS OF CUT-BANK SURVEY
LOCATIONS OF SEISMIC REFRACTION SURVEY
LOCATIONS OF GROUND PENETRATING RADAR SURVEY
LOCATIONS OF SOIL BORINGS NOTED IN TEXT
LOCATIONS OF CONTROLLED TEST EXCAVATIONS
CR-415 LOCATIONS OF PREVIOUSLY UNREPORTED SITES
1
19
20
30
34
35
900
700
Creek

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography by photogrammetric methods from aerial photographs taken 1958. Field checked 1962

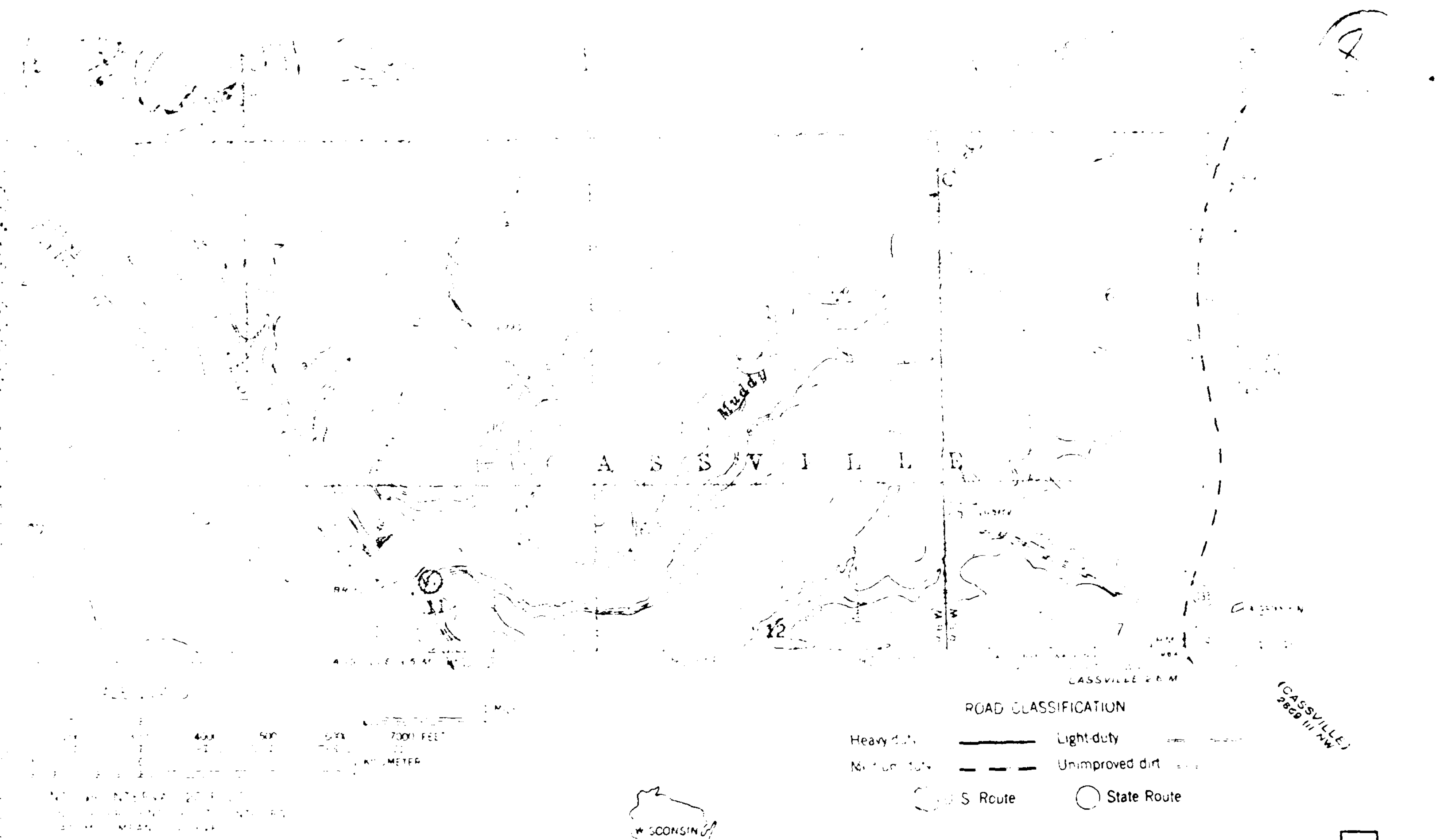
Polyconic projection. 1927 North American datum
10,000-foot grids based on Wisconsin coordinate system, south zone and Iowa coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

UTM GRID AND 1962 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL

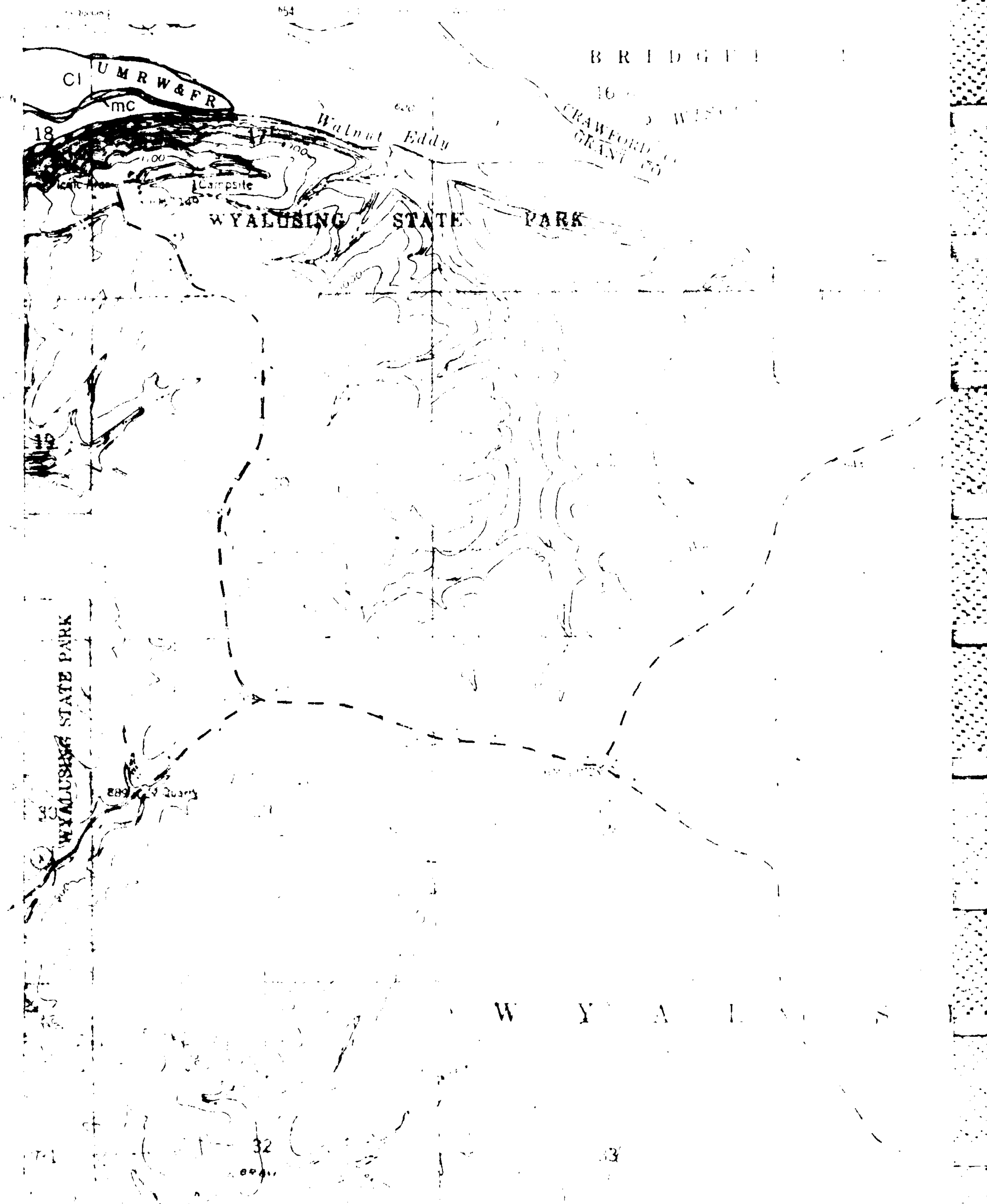
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER
THE WISCONSIN GEOLOGICAL AND NATURAL H
AND BY THE IOWA GEOLOGICAL
A FOLDER DESCRIBING TOPOGRAPHIC MAPS A

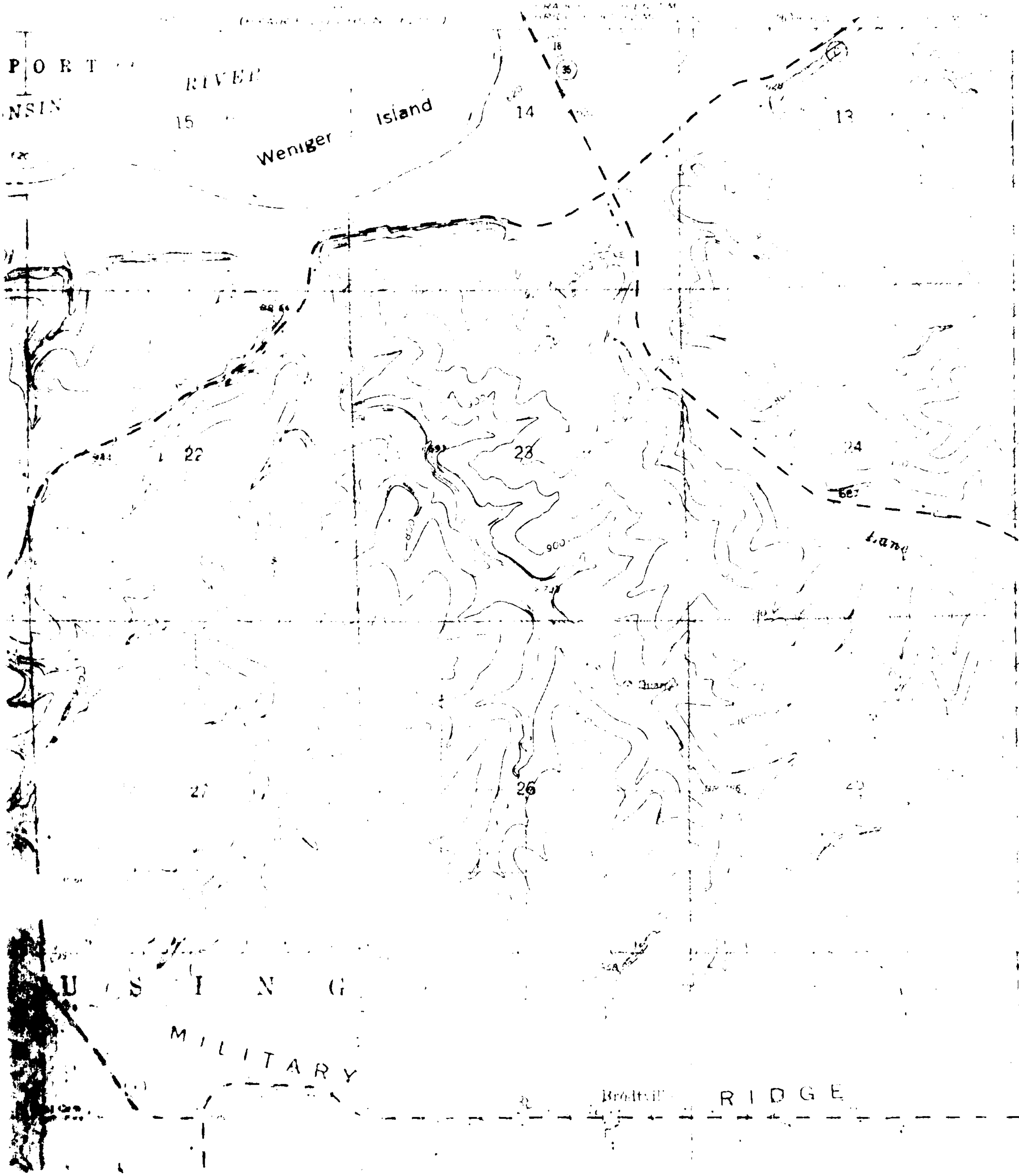


MPLIES WITH NATIONAL MAP ACCURACY STANDARDS
AL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
AL AND NATURAL HISTORY SURVEY, MADISON 6, WISCONSIN
IOWA GEOLOGICAL SURVEY, IOWA CITY, IOWA
TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

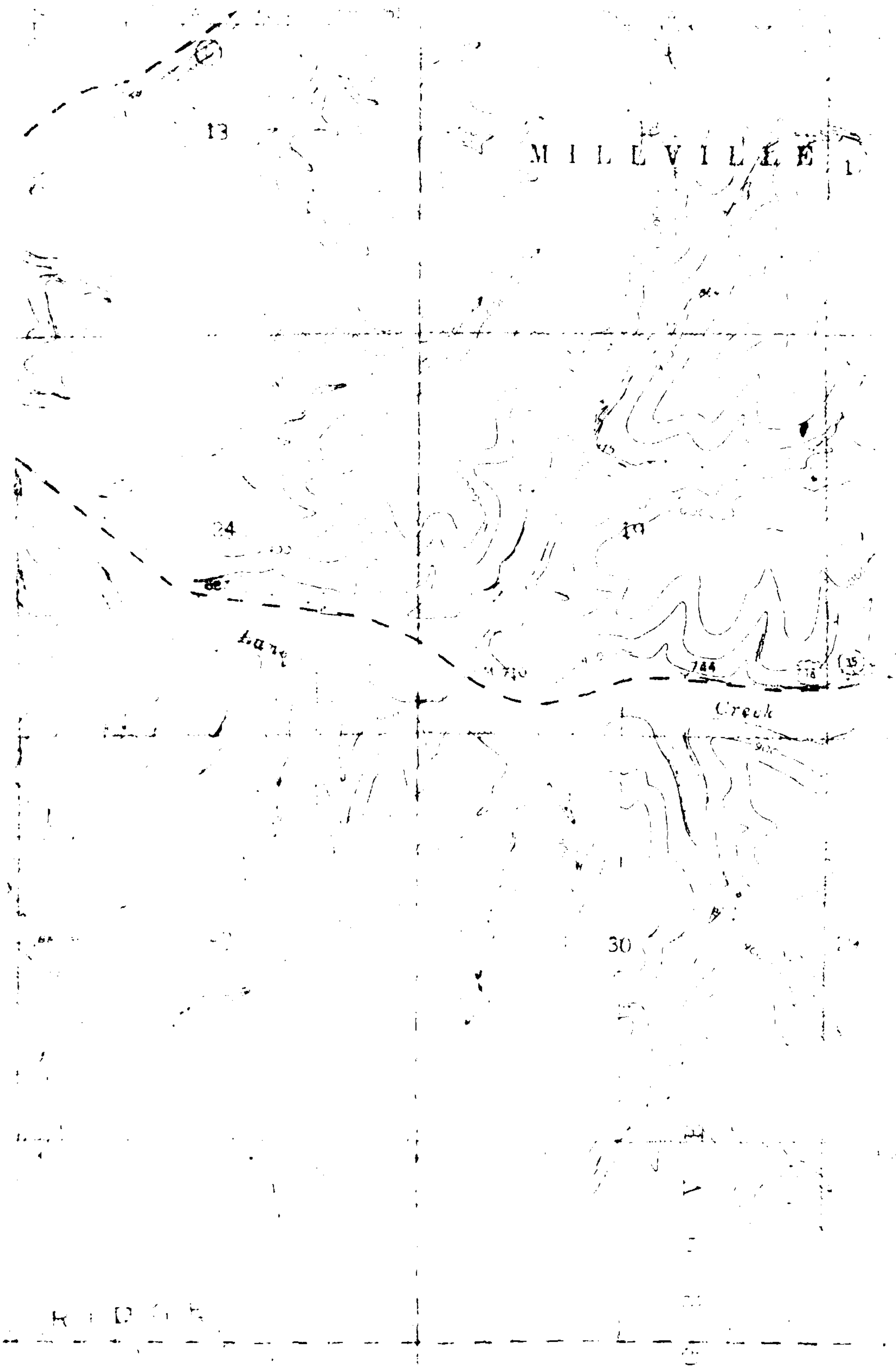
GEOMORPHOLOGY OF POOL 10
GUTTENBERG
PLATE 7

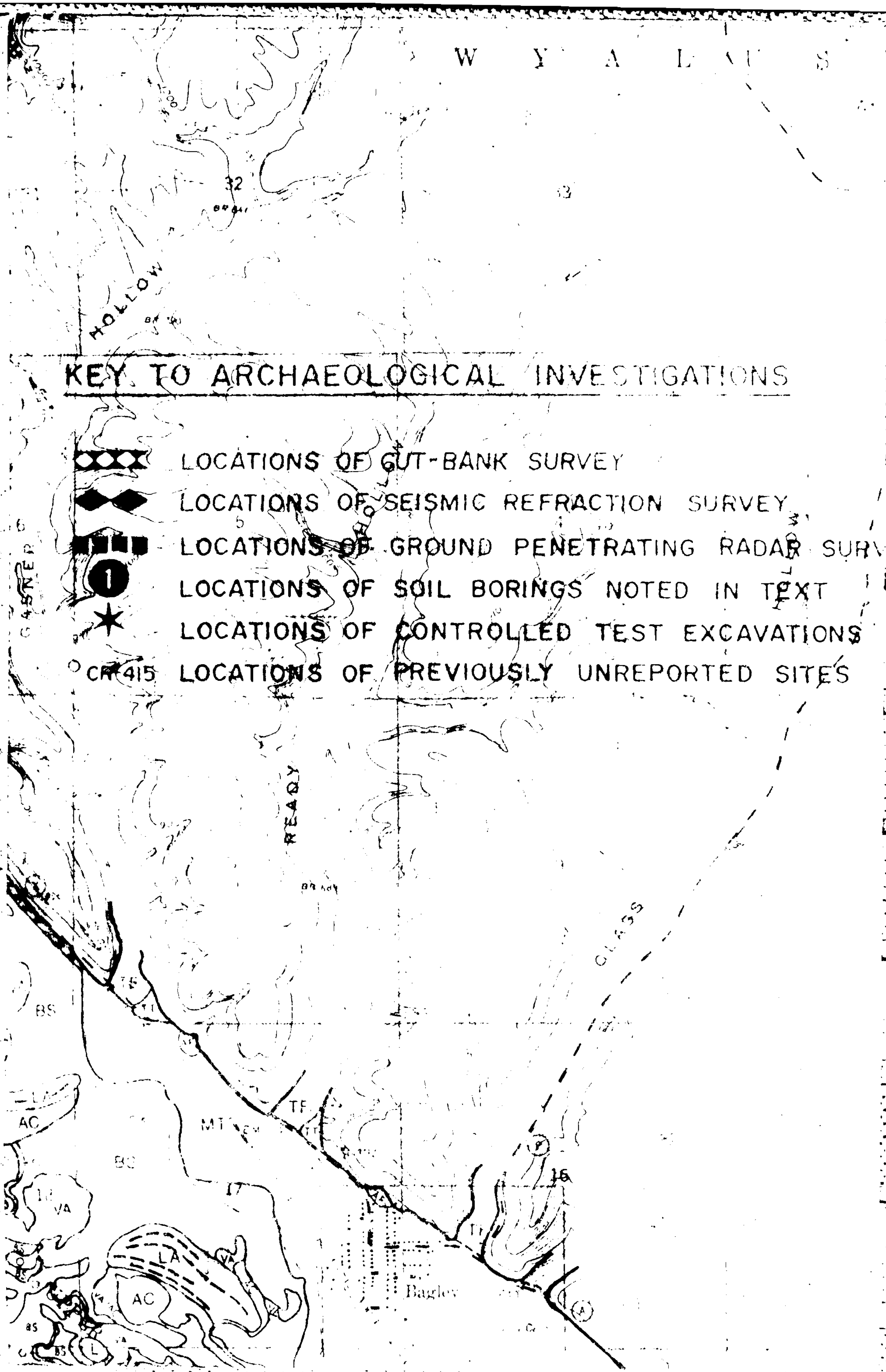
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

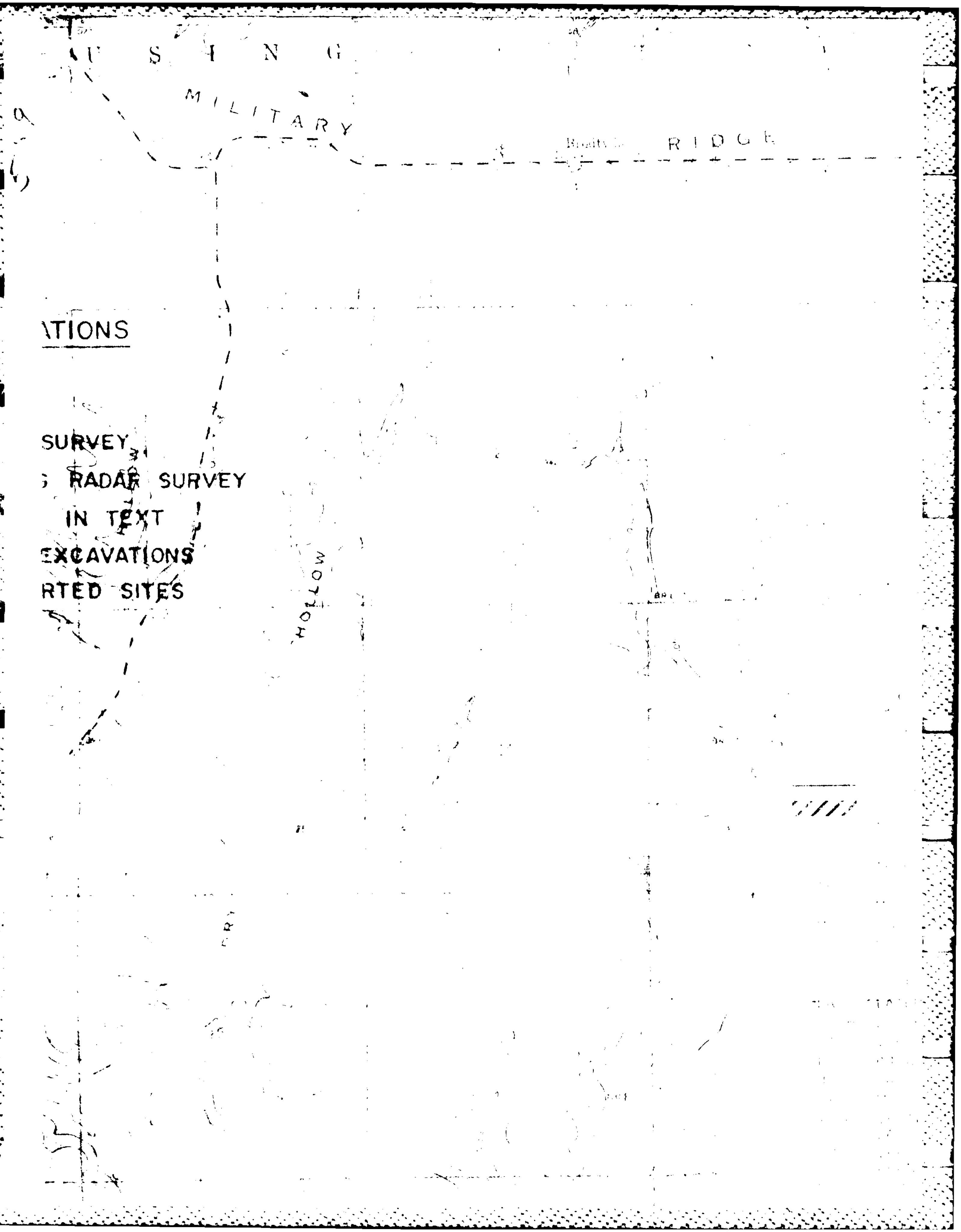



RIVER
Weniger Island
15
14
13
22
23
24
27
26
900
Lane
U S I N G
MILITARY
RIDGE

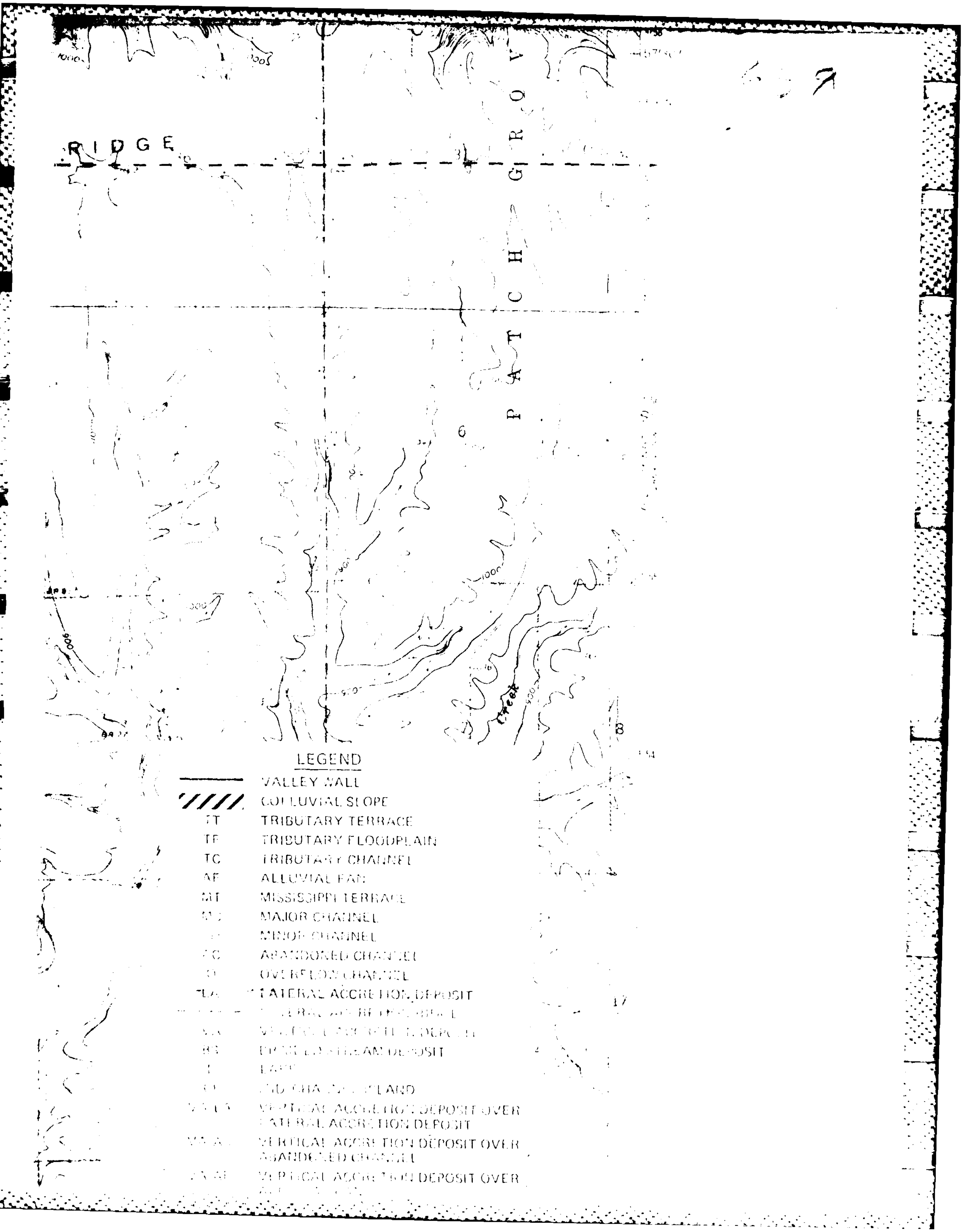
BAGLEY QUADRANGLE
WISCONSIN IOWA
7.5 MINUTE SERIES (TOPOGRAPHIC)




KEY TO ARCHAEOLOGICAL INVESTIGATIONS
LOCATIONS OF CUT-BANK SURVEY
LOCATIONS OF SEISMIC REFRACTION SURVEY
LOCATIONS OF GROUND PENETRATING RADAR SURV
1 LOCATIONS OF SOIL BORINGS NOTED IN TEXT
LOCATIONS OF CONTROLLED TEST EXCAVATIONS
CR 415 LOCATIONS OF PREVIOUSLY UNREPORTED SITES
HOLLOW
READY
GLASS
32
16
17
AC
BS
LA
Bagley



USING
MILITARY
RIDGE
ATIONS
SURVEY
RADAR SURVEY
IN TEXT
EXCAVATIONS
RTED SITES
HOLLOW


RIDGE
PATCH GROVE
Creek
1000
900
LEGEND
VALLEY WALL
COLLUVIAL SLOPE
TT TRIBUTARY TERRACE
TF TRIBUTARY FLOODPLAIN
TC TRIBUTARY CHANNEL
AF ALLUVIAL FAN
MT MISSISSIPPI TERRACE
MAJOR CHANNEL
MINOR CHANNEL
ABANDONED CHANNEL
OVERFLOW CHANNEL
LATERAL ACCRETION DEPOSIT
VERTICAL ACCRETION DEPOSIT OVER LATERAL ACCRETION DEPOSIT
VERTICAL ACCRETION DEPOSIT OVER ABANDONED CHANNEL
VERTICAL ACCRETION DEPOSIT OVER

749

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Control by USGS, USC&GS, and USCE

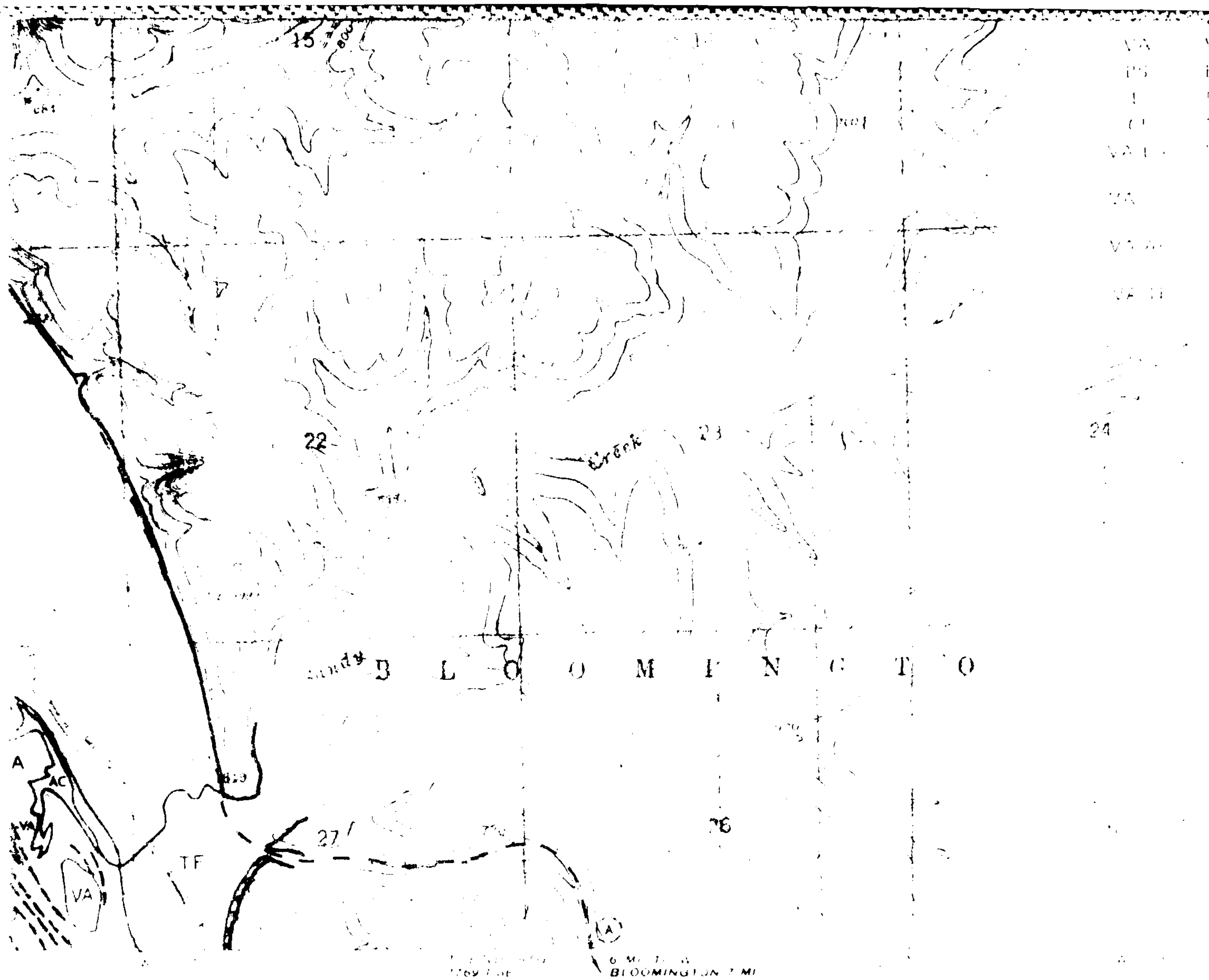
Topography by photogrammetric methods from aerial photographs taken 1958. Field checked 1962

Polyconic projection. 1927 North American datum
10,000 foot grid based on Wisconsin coordinate system, south zone and Iowa coordinate system, north zone
1000 meter Universal Transverse Mercator grid ticks, zone 15, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

MN
GN
1°19'
23 MILS
UTM GRID AND 1962 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

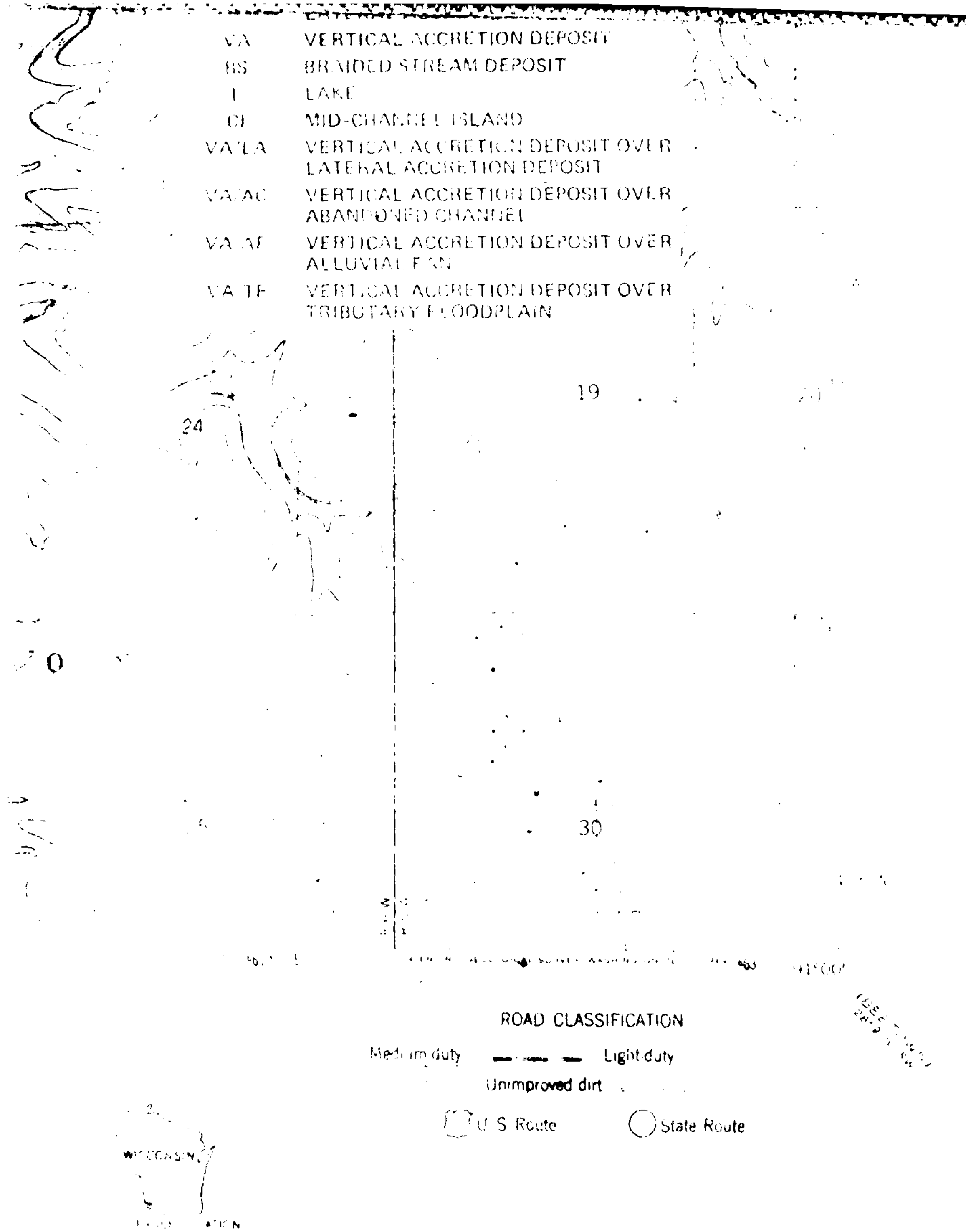
ALE BY S. GE
THE WISCONSIN GE
AND



SCALE

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
... BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
... WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, MADISON 6, WISCONSIN
AND BY THE IOWA GEOLOGICAL SURVEY, IOWA CITY, IOWA
... DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

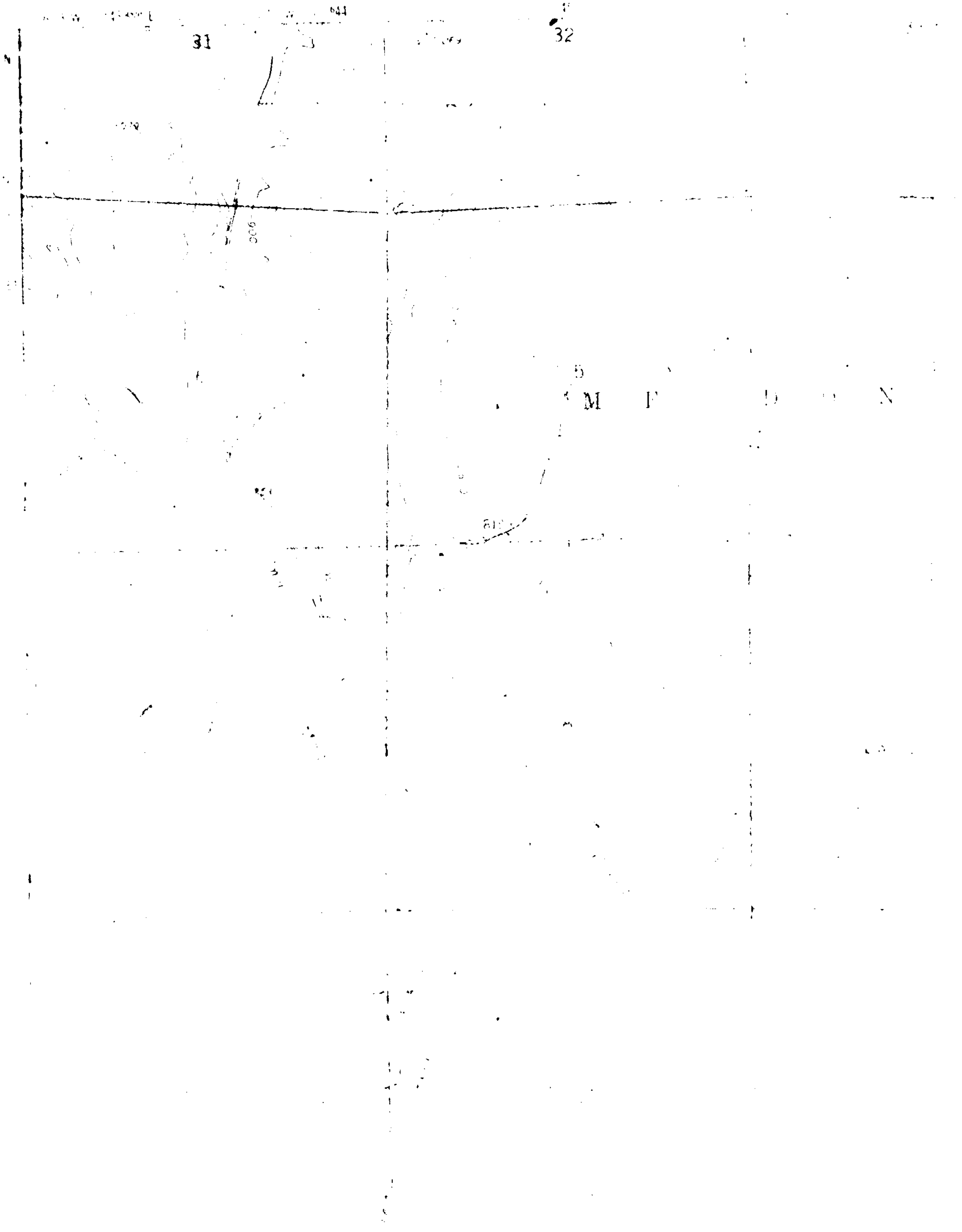
9 of 9

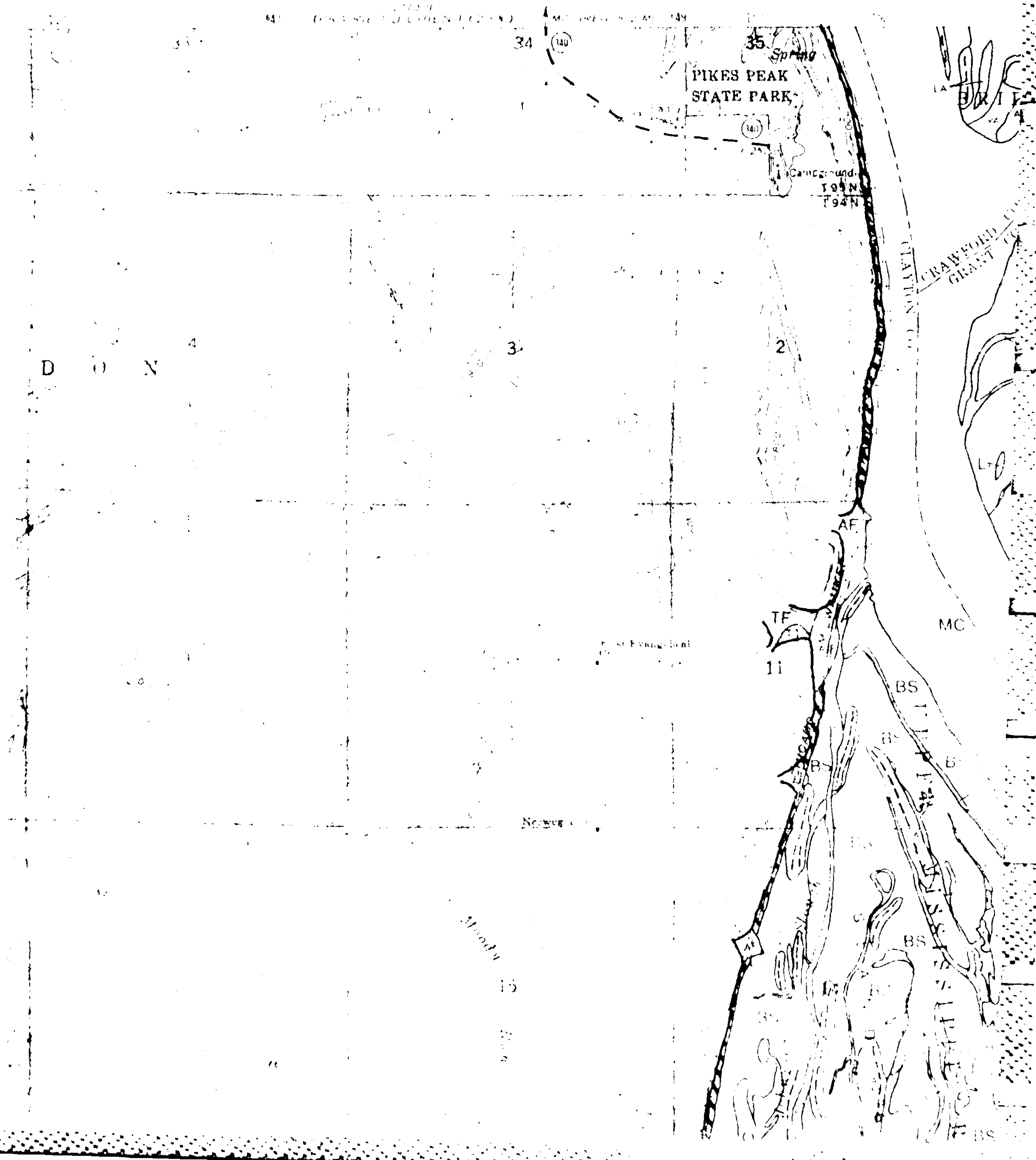


GEOMORPHOLOGY OF POOL 10
BAGLEY
PLATE 6

1059

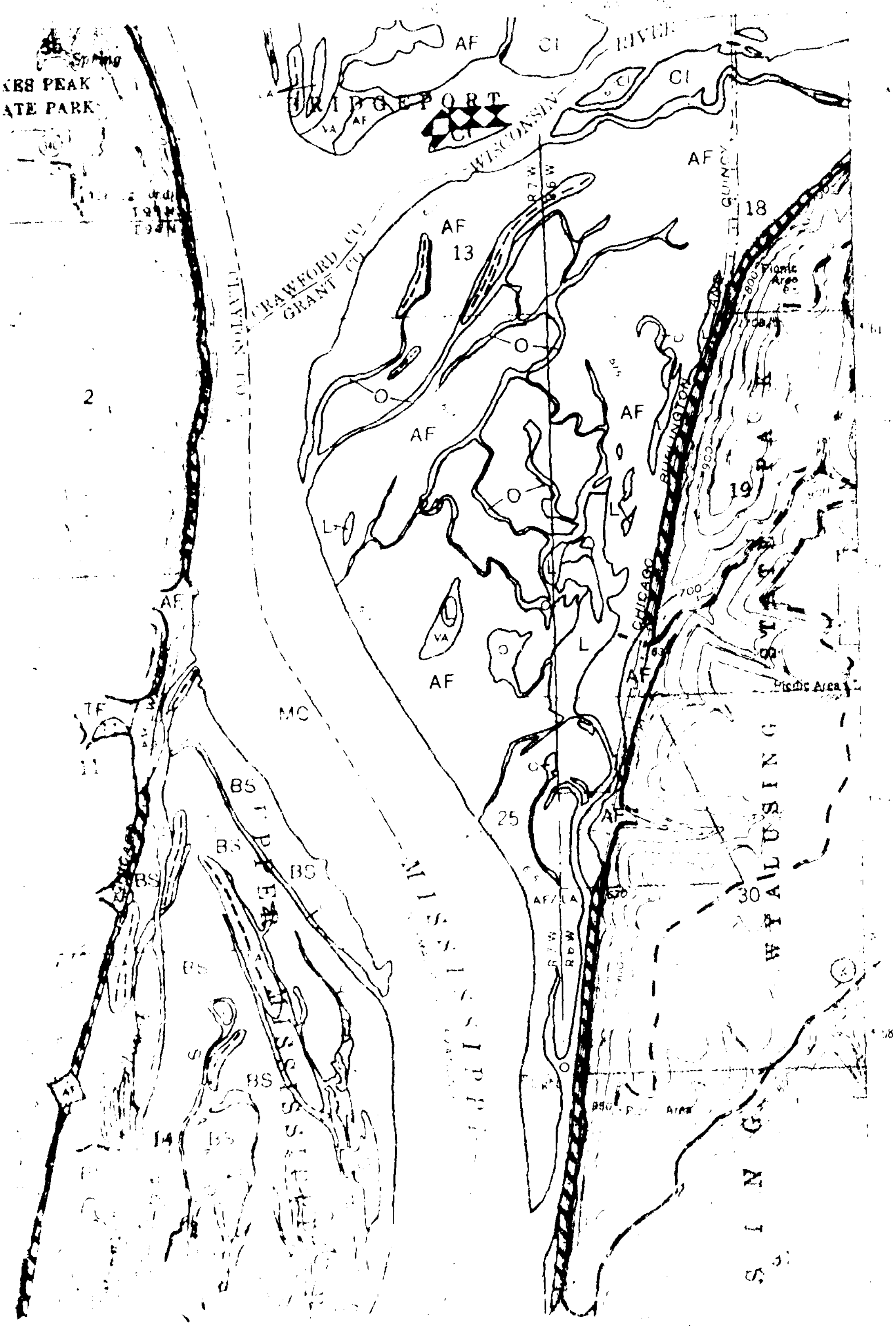
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY




34
35
Spring
PIKES PEAK
STATE PARK
Campground
T95N
T94N
CLAYTON CO.
CRAWFORD CO.
GRANT CO.
D O N
4
3
2
AF
TF
11
MC
BS
15

209

CLAYTON QUADRANGLE
IOWA - WISCONSIN
7.5 MINUTE SERIES (TOPOGRAPHIC)

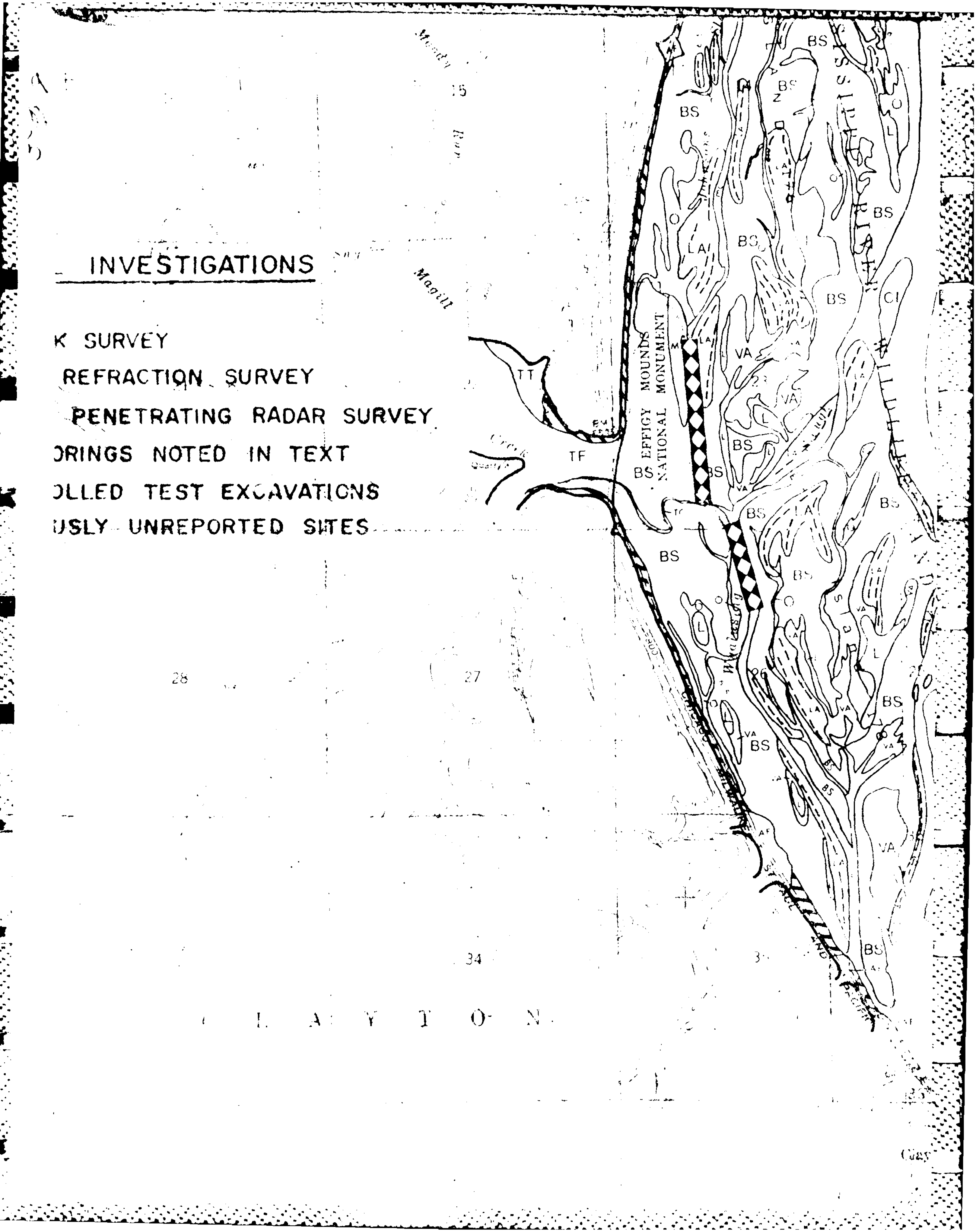


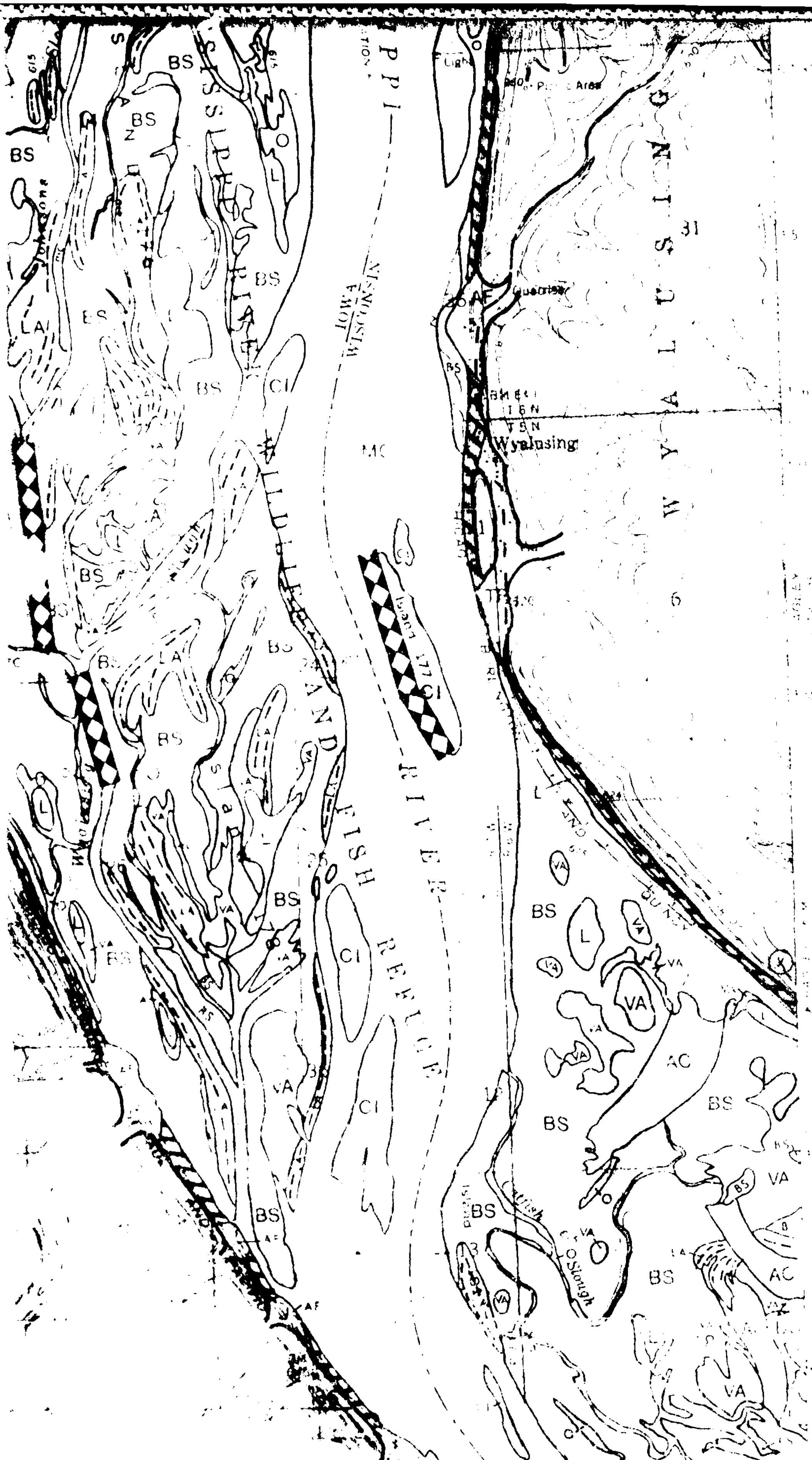
KEY TO ARCHAEOLOGICAL INVESTI

- LOCATIONS OF CUT-BANK SURVEY
- LOCATIONS OF SEISMIC REFRACTION
- LOCATIONS OF GROUND PENETRATI
- 1 LOCATIONS OF SOIL BORINGS NOTE
- LOCATIONS OF CONTROLLED TEST
- CR-415 LOCATIONS OF PREVIOUSLY UNREP

LEGEND

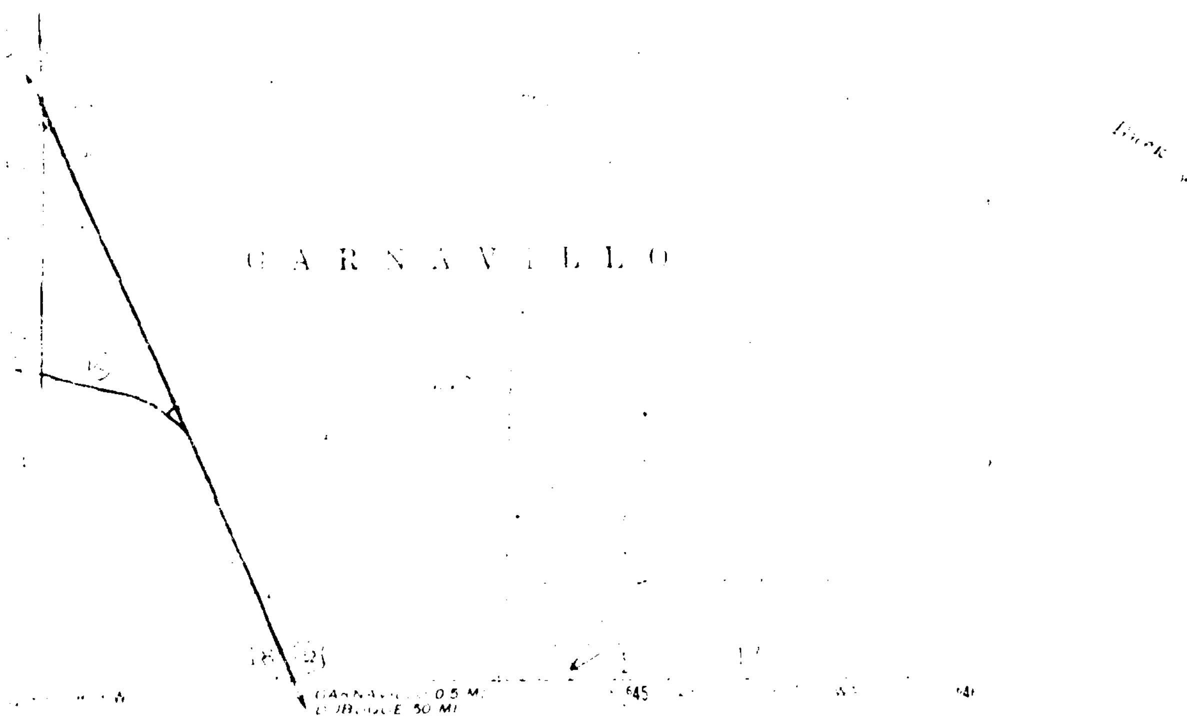
	VALLEY WALL
	COLLUVIAL SLOPE
[illegible]	TRIBUTARY TERRACE
[illegible]	TRIBUTARY FLOODPLAIN
[illegible]	TRIBUTARY CHANNEL
[illegible]	ALLUVIAL FAN
[illegible]	MISSISSIPPI TERRACE
[illegible]	MAJOR CHANNEL
[illegible]	MINOR CHANNEL
AC	ABANDONED CHANNEL
O	OVERFLOW CHANNEL
LA	LATERAL ACCRETION DEPOSIT
	LATERAL ACCRETION RIDGE
VA	VERTICAL ACCRETION DEPOSIT
[illegible]	BRAIDED STREAM DEPOSIT
L	LAKE
CI	MID-CHANNEL ISLAND
VA LA	VERTICAL ACCRETION DEPOSIT OVER LATERAL ACCRETION DEPOSIT
VA AC	VERTICAL ACCRETION DEPOSIT OVER ABANDONED CHANNEL
VA AF	VERTICAL ACCRETION DEPOSIT OVER ALLUVIAL FAN
[illegible]	VERTICAL ACCRETION [illegible]


INVESTIGATIONS
K SURVEY
REFRACTION SURVEY
PENETRATING RADAR SURVEY
ORINGS NOTED IN TEXT
OLLED TEST EXCAVATIONS
USLY UNREPORTED SITES
EFFIGY MOUNDS NATIONAL MONUMENT
Magill
TT
TF
BS
VA
LA
CLAYTON
28
27
34
15


MISSISSIPPI
IOWA
WISCONSIN
WILDLIFE AND FISH REFUGE
RIVER
WYALUSING
Wyalusing
Clayton

7

BS	BRAIDED STREAM DEPOSIT
L	LAKE
CI	MID-CHANNEL ISLAND
VA LA	VERTICAL ACCRETION DEPOSIT OVER LATERAL ACCRETION DEPOSIT
VA AC	VERTICAL ACCRETION DEPOSIT OVER ABANDONED CHANNEL
VA AF	VERTICAL ACCRETION DEPOSIT OVER ALLUVIAL FAN
VA TF	VERTICAL ACCRETION DEPOSIT OVER TRIBUTARY FLOODPLAIN



Mapped, edited and published by the Geological Survey

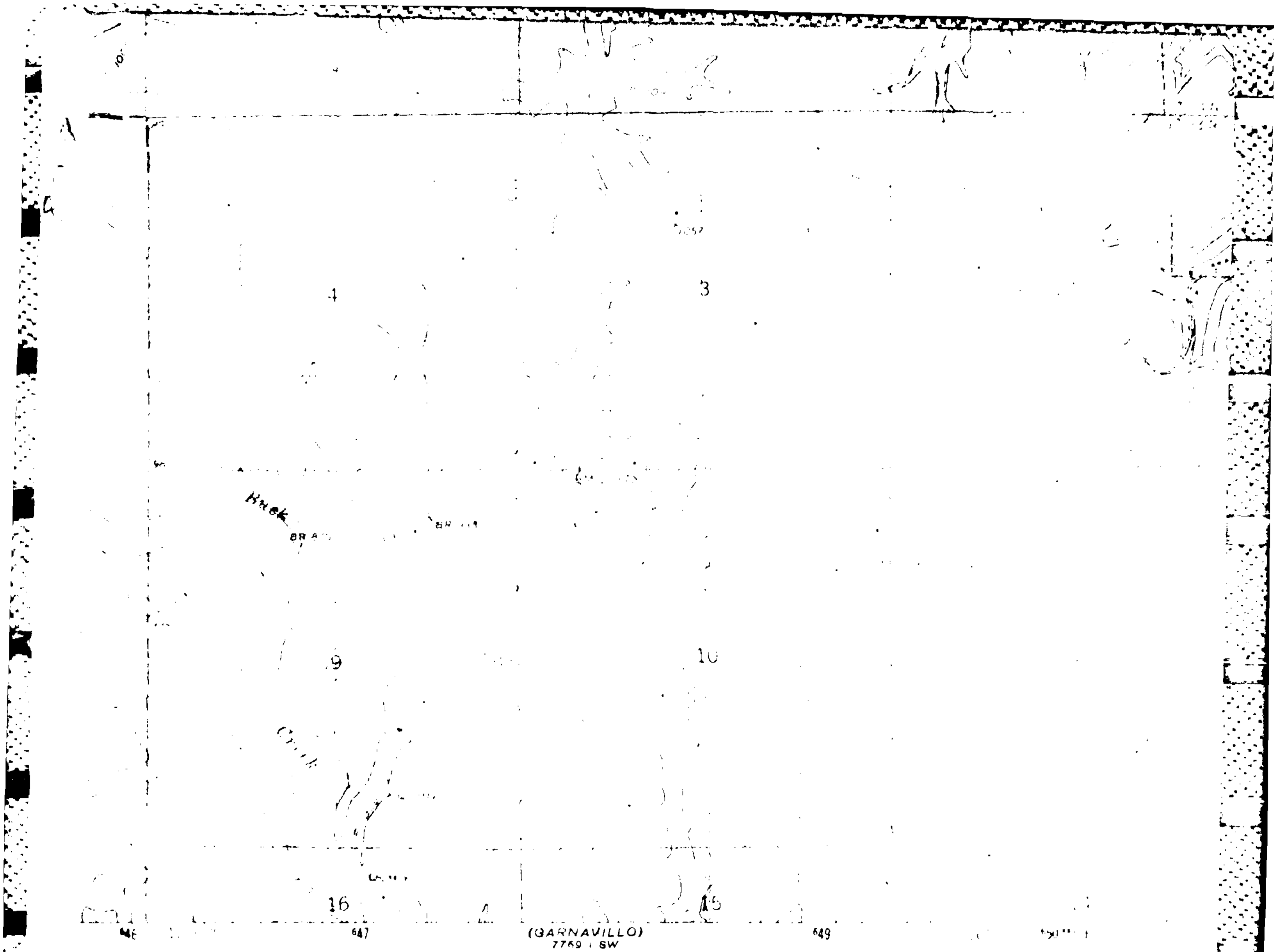
Topography by photogrammetric methods from aerial photographs taken 19... Field checked 1962

North American datum

Iowa coordinate system, south zone

Transverse Mercator grid ticks

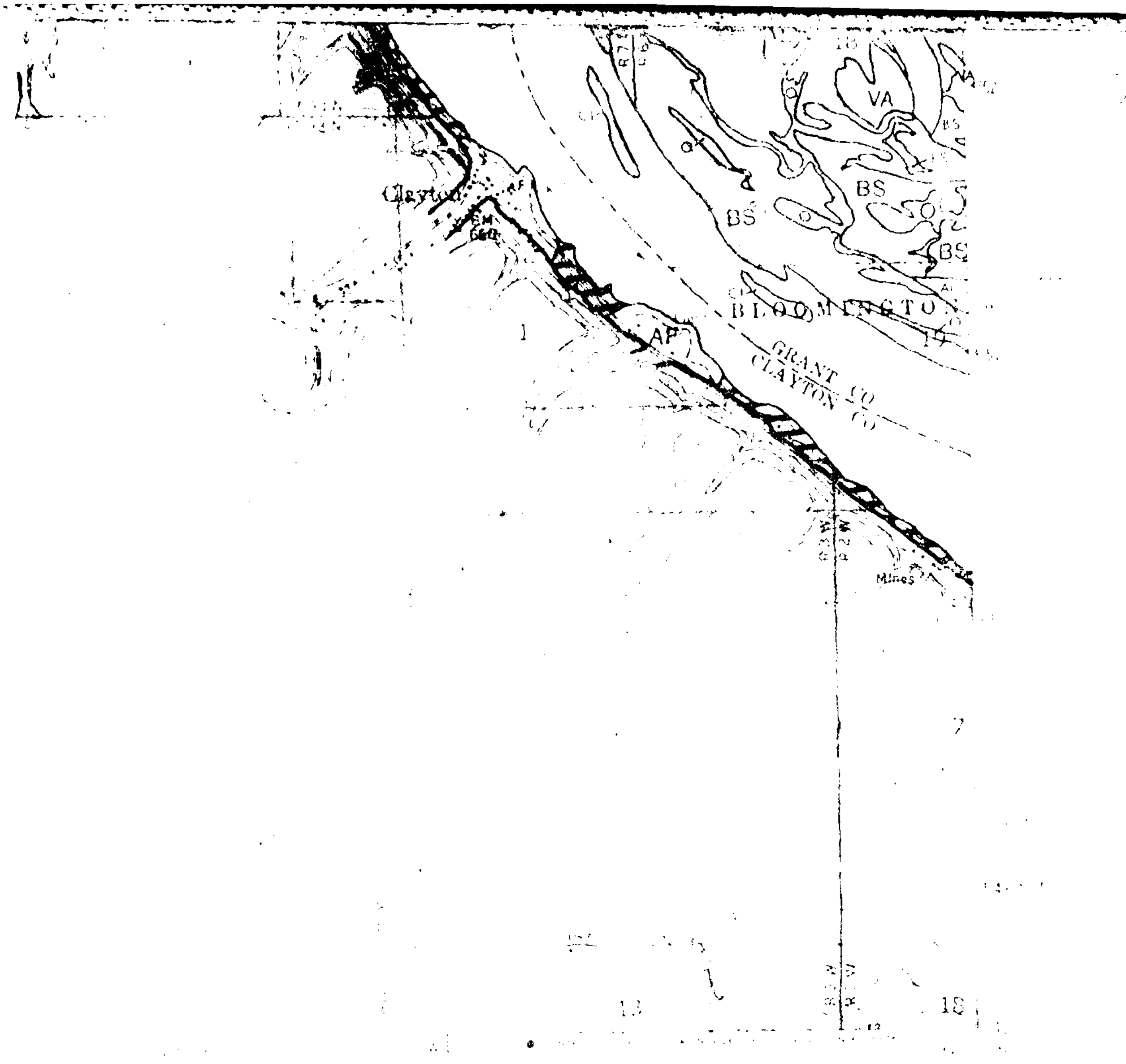
Field checked ... 1962 MAGNETIC DECLINATION



SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U S GEOLOGICAL SURVEY, DENVER, COLORADO 80225 OR RESTON, VIRGINIA 22092
AND BY THE IOWA GEOLOGICAL SURVEY, IOWA CITY, IOWA 52240
AND BY THE WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, MADISON, WISCONSIN 53706
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



ROAD CLASSIFICATION

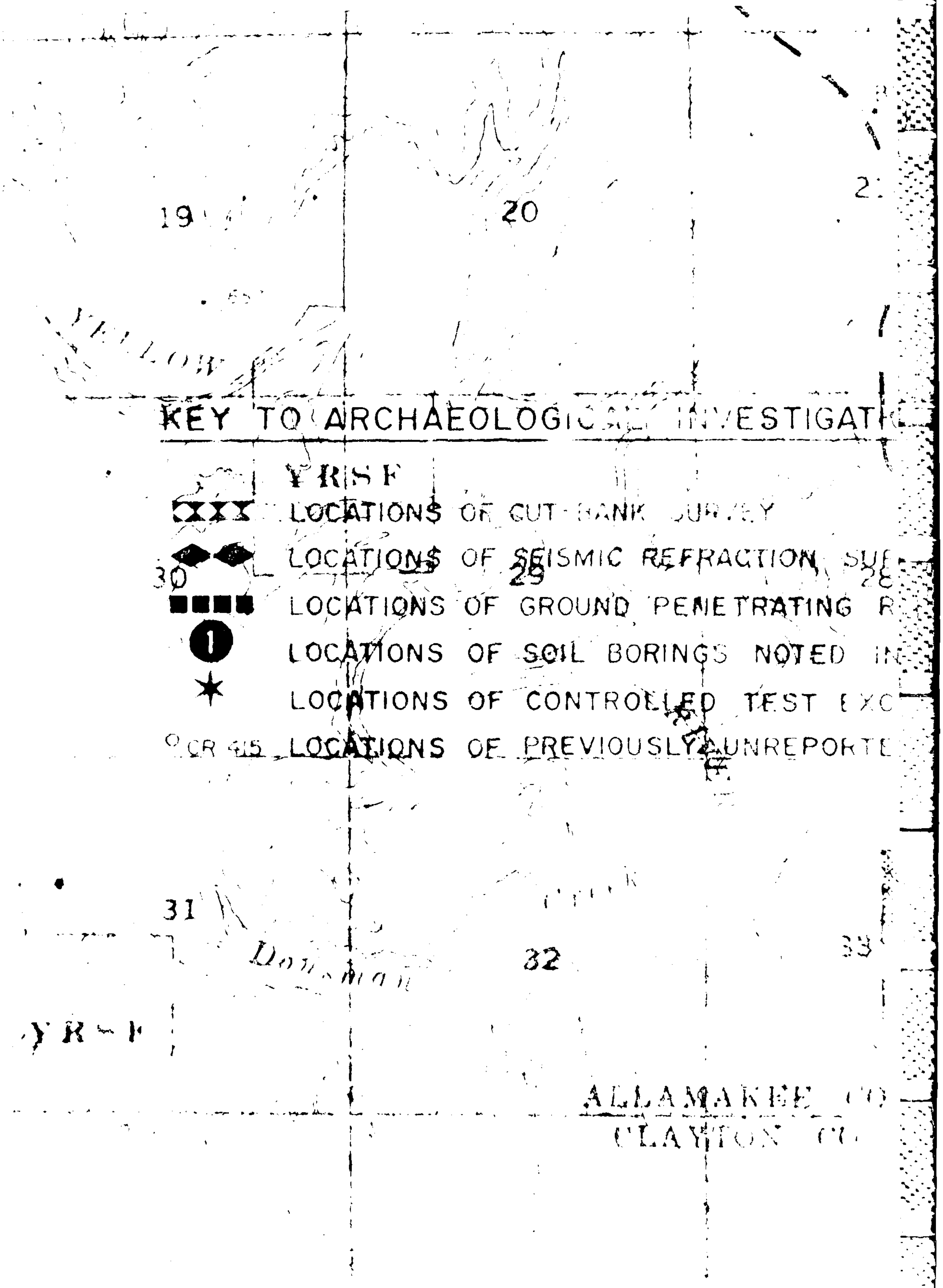
Light duty

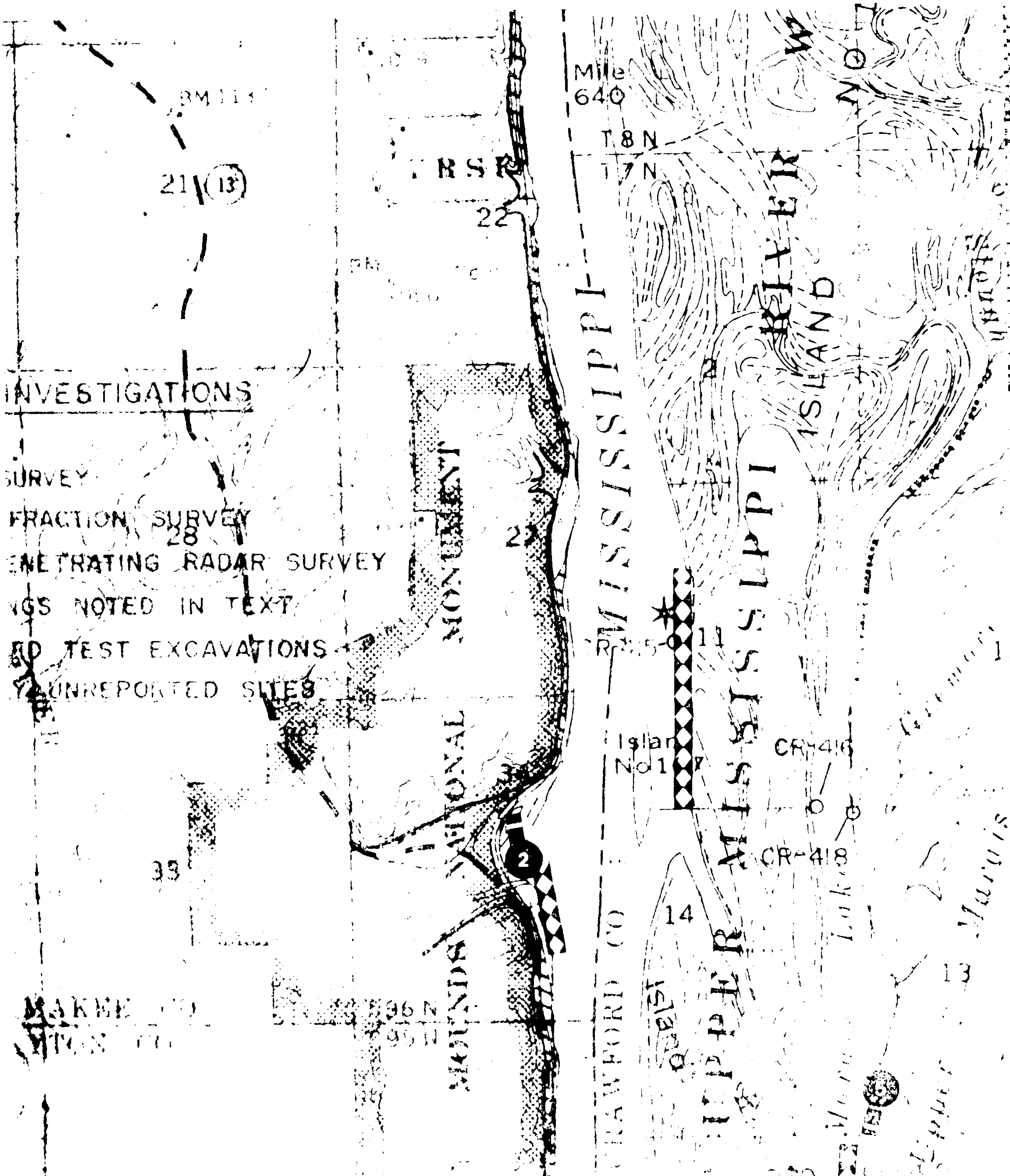
Unimproved dirt

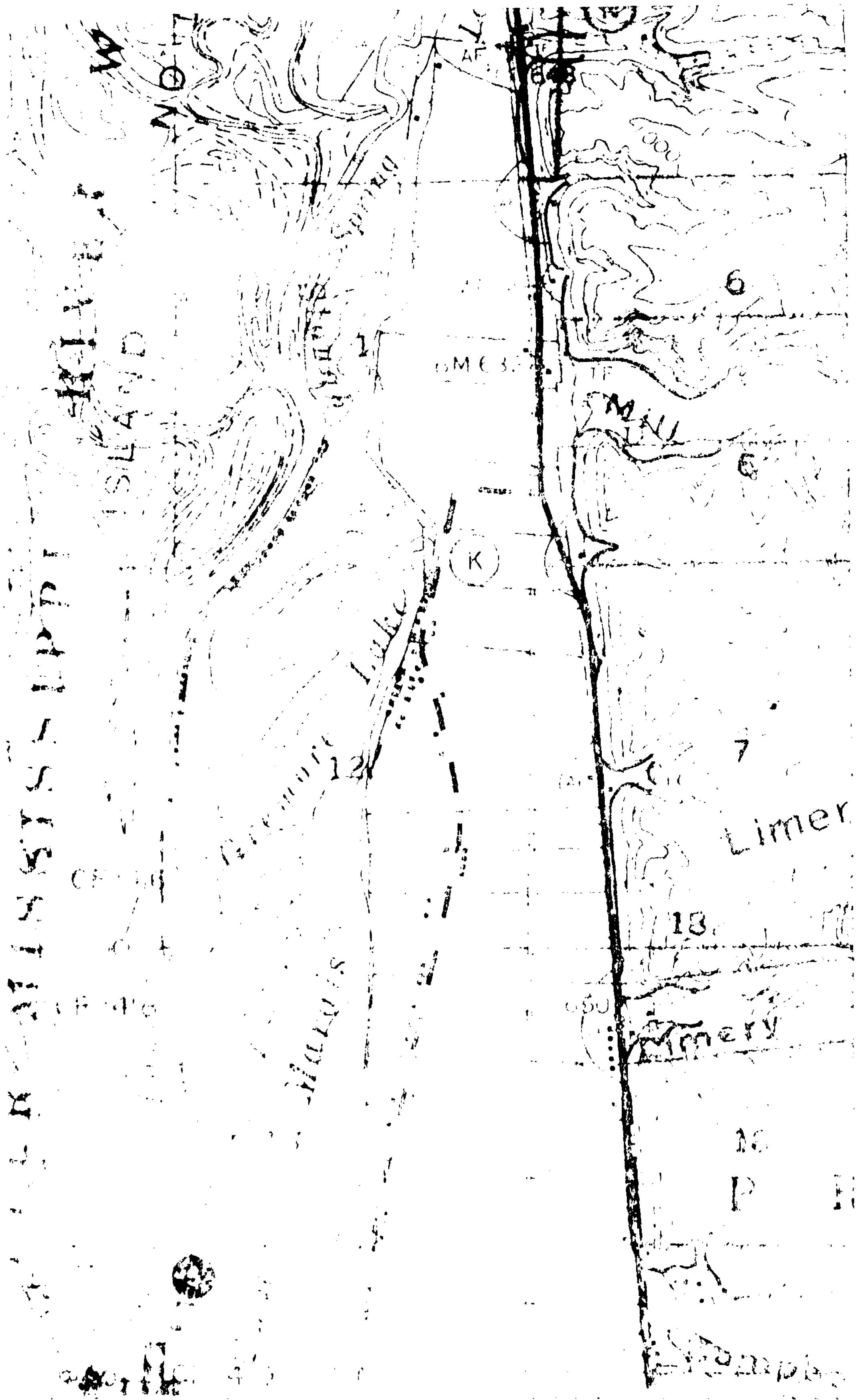
U.S. Route

State Route

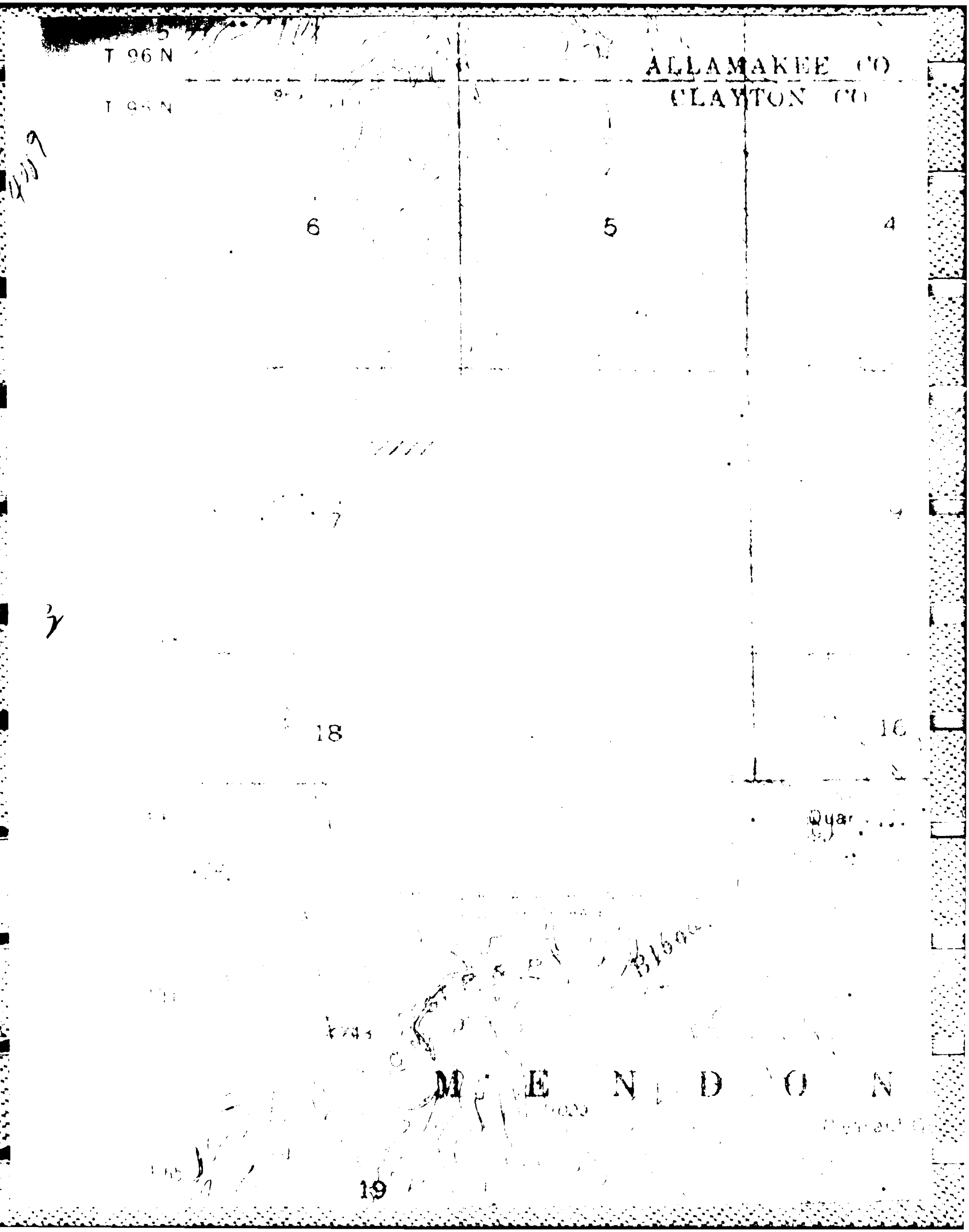
GEOMORPHOLOGY OF POOL 10
CLAYTON
PLATE 5

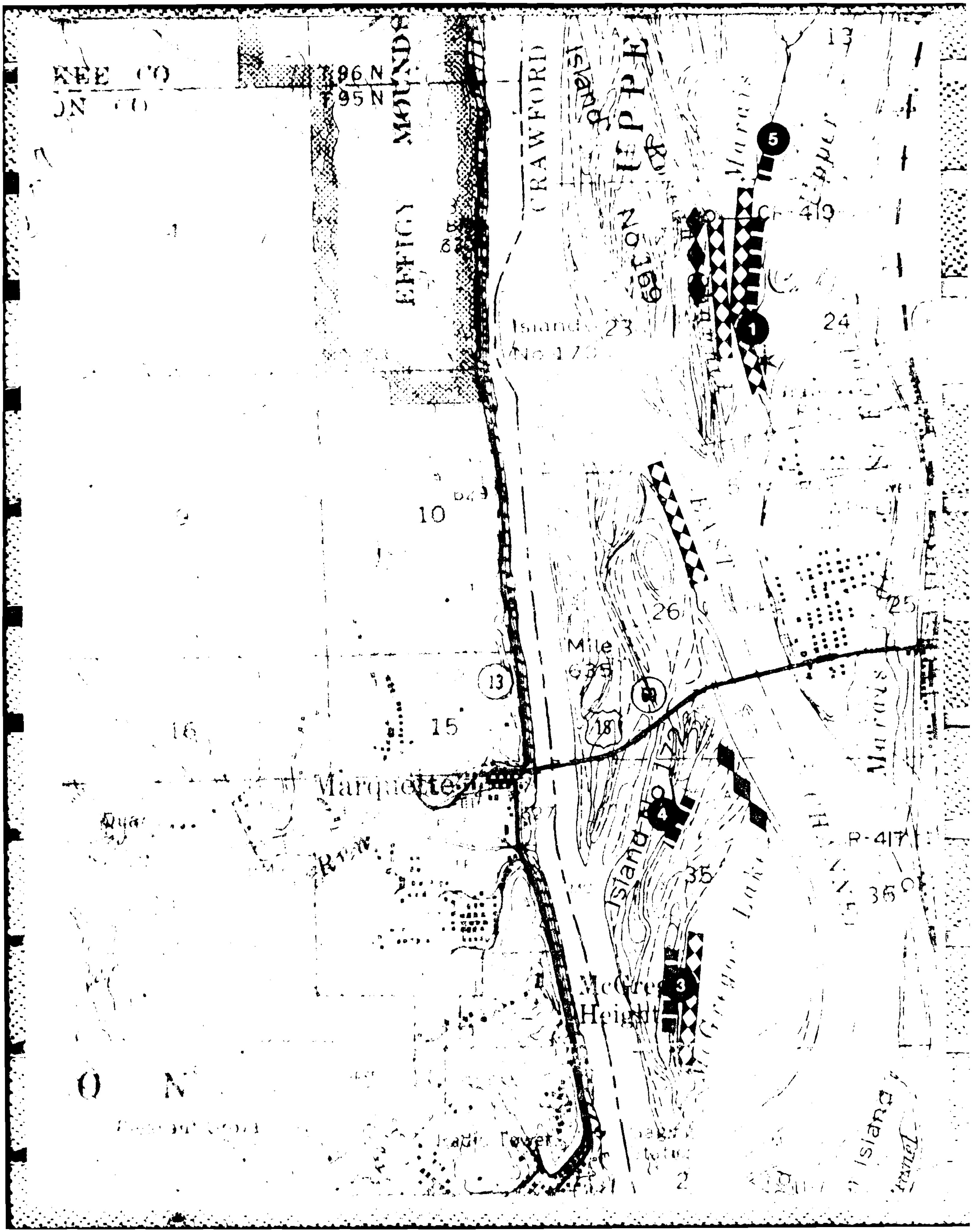

19
20
KEY TO ARCHAEOLOGICAL INVESTIGAT
YRSF
LOCATIONS OF CUT-BANK SURVEY
LOCATIONS OF SEISMIC REFRACTION SU
30
29
LOCATIONS OF GROUND PENETRATING R
LOCATIONS OF SOIL BORINGS NOTED IN
LOCATIONS OF CONTROLLED TEST EXC
LOCATIONS OF PREVIOUSLY UNREPORTE
31
Creek
Dousman
32
YR-F
ALLAMAKEE CO
CLAYTON CO


INVESTIGATIONS
SURVEY
FRACTION SURVEY
ENETRATING RADAR SURVEY
NGS NOTED IN TEXT
ED TEST EXCAVATIONS
UNREPORTED SITES
Mile
640
T8N
T7N
21
22
27
28
33
13
14
MONUMENT
MISSISSIPPI
ISLAND
Island
CR-416
CR-418



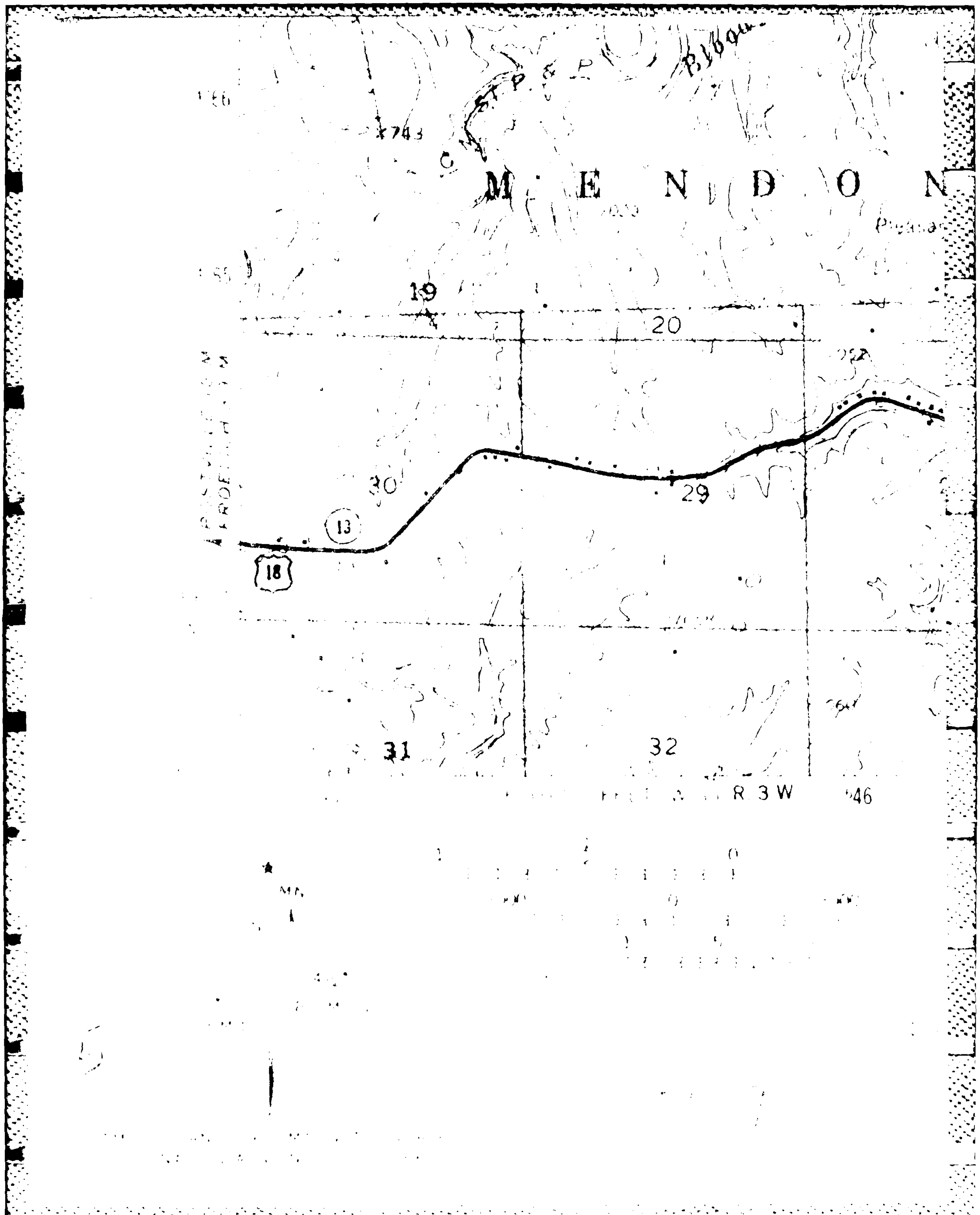
6
6
7
Limer
13
12
K
Lake


T 96 N
ALLAMAKEE CO
CLAYTON CO
6
5
4
7
18
19
MENDON

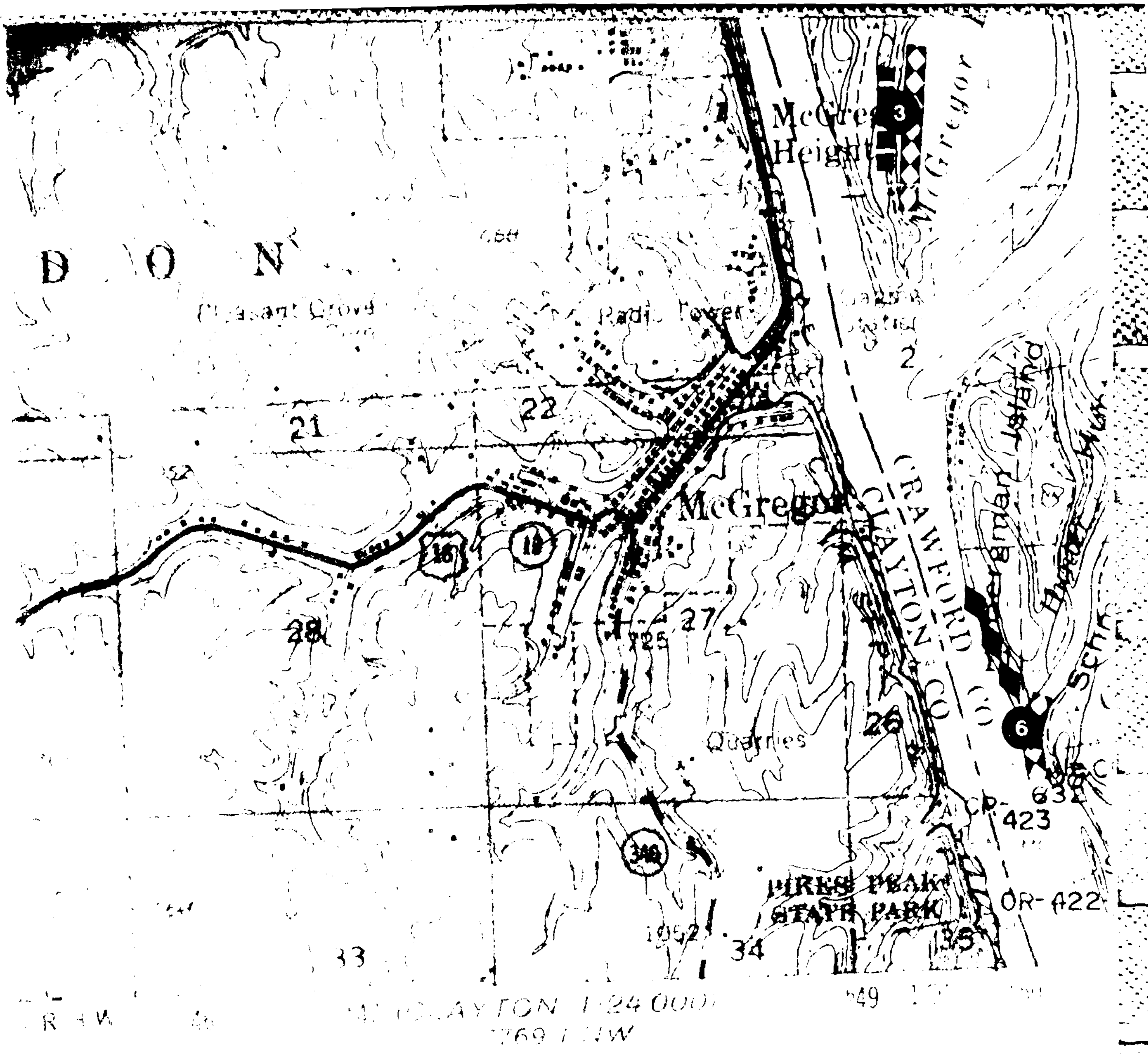


T96N
T95N
EFFIGY MOUNDS
CRAWFORD
Island
UPPER
No 169
Island 23
No 170
Marais
Upper
CR-419
24
10
26
Mile 633
25
13
18
16
15
Marquette
Island
35
36
R-417
Marais
McGregor Heights
Radio Tower
Island

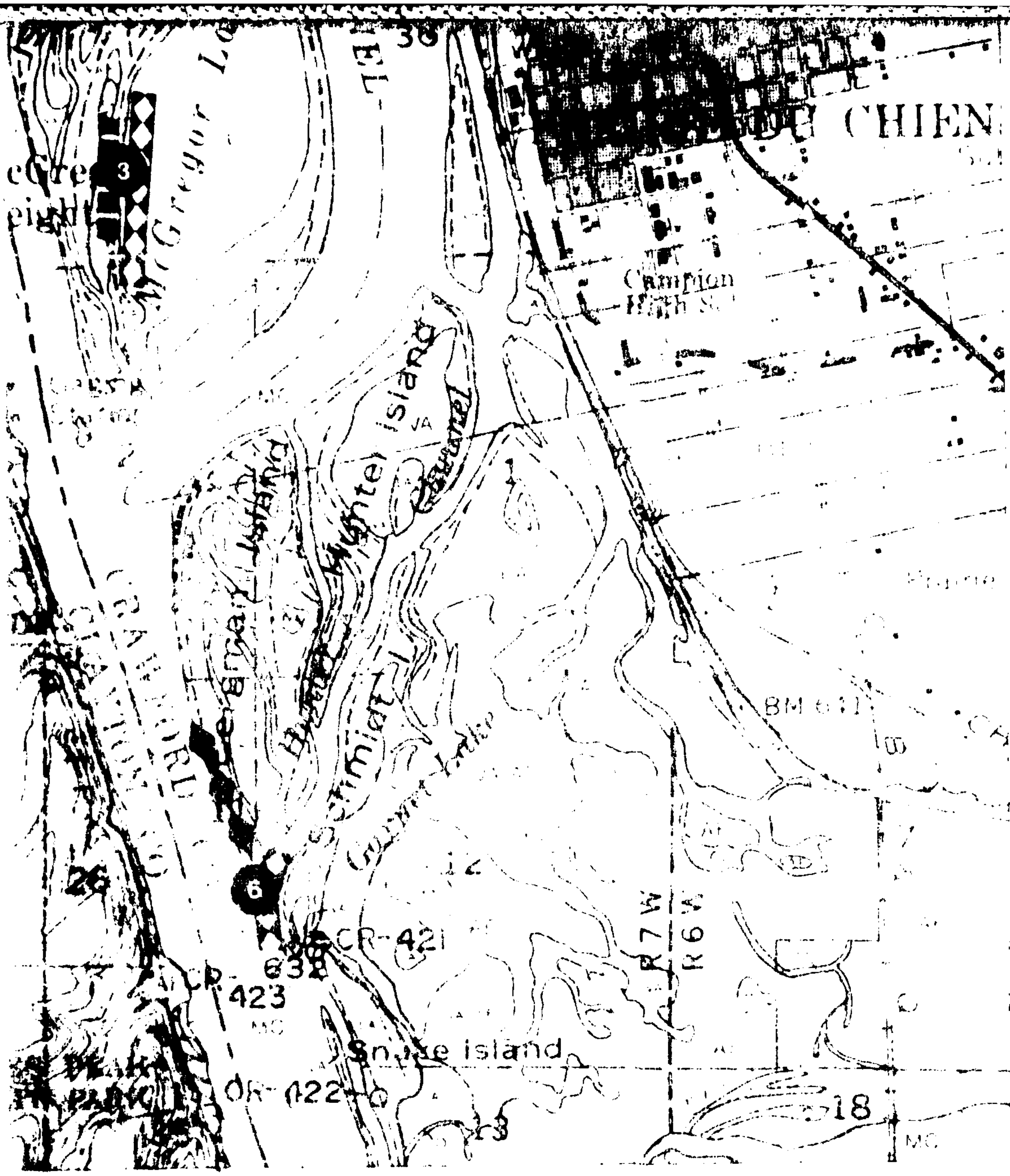

18
13
19
24
25
26
27
36
CR-419
R-417
Upper
Marais
Campbe
Pits
CHIEN



M E N D O N
19
20
30
29
13
18
31
32
R 3 W



CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

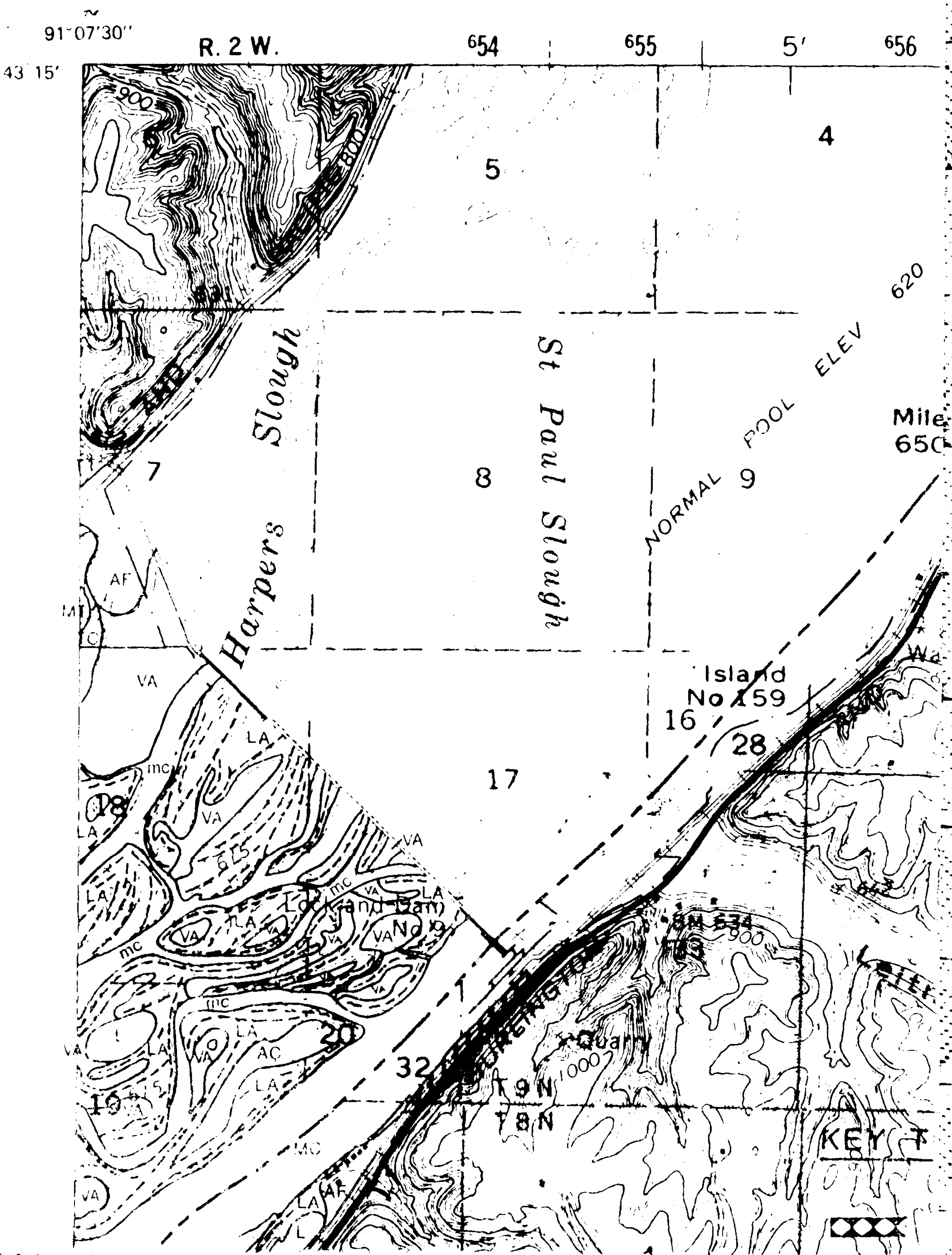


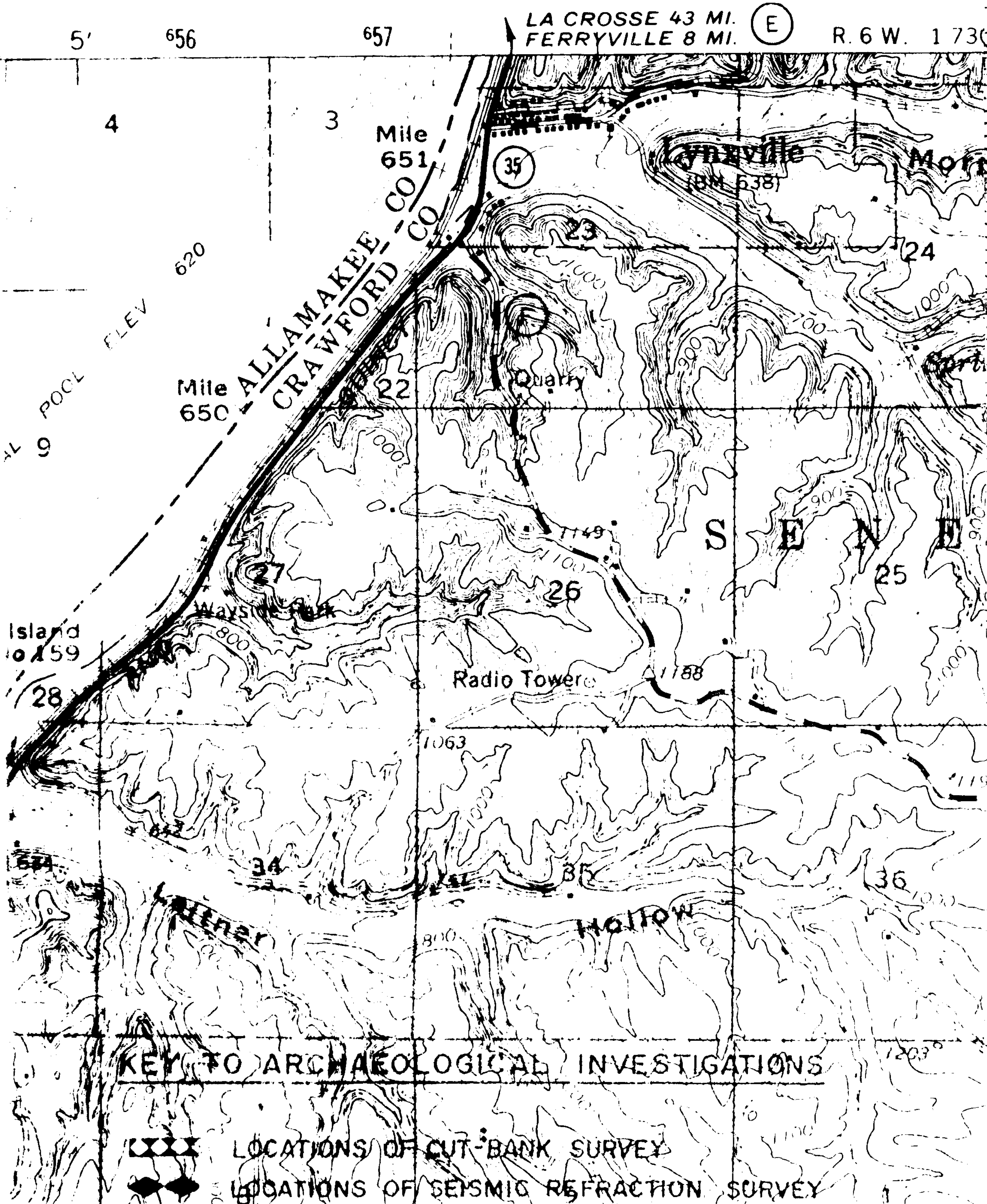
3 MILES

FEET

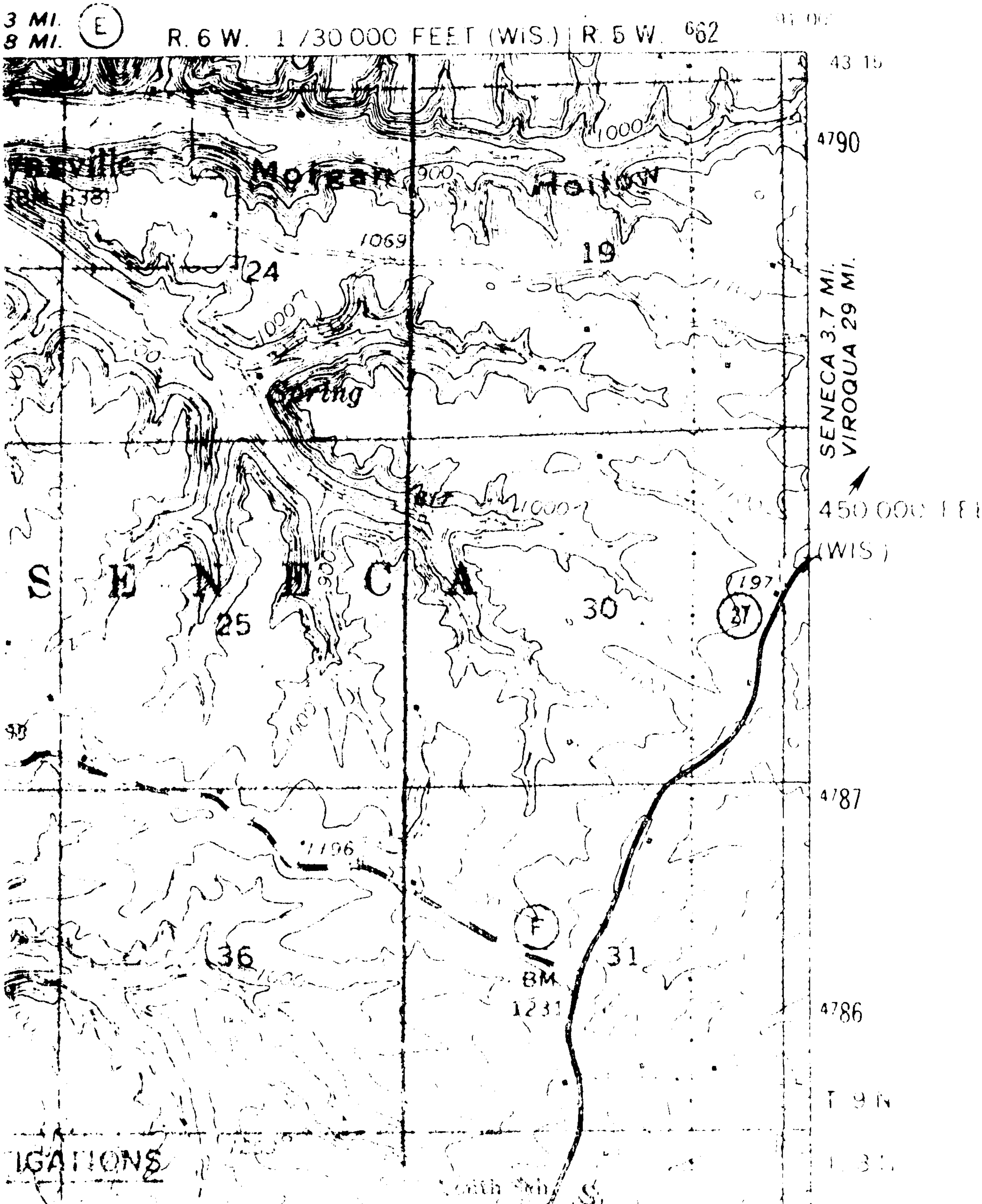
METERS

GEOMORPHOLOGY OF POOL 10

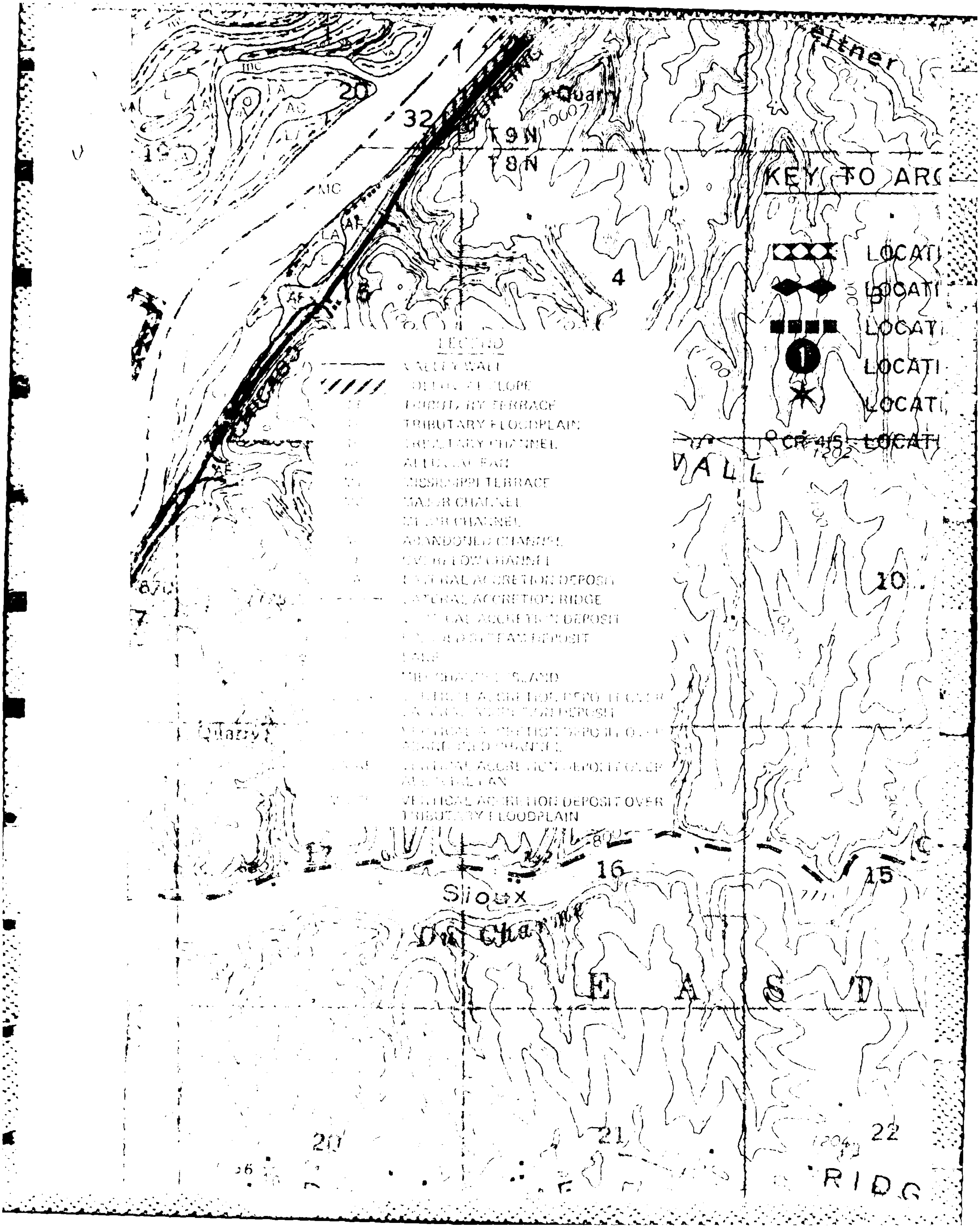

91°07'30"
R. 2 W.
654
655
5'
656
43°15'
4
5
900
800
Slough
St Paul Slough
Harpers
NORMAL POOL ELEV 620
Mile
650
7
8
9
AF
VA
Island
No 159
16
28
17
LA
mc
18
615
Lock and Dam
No 9
BM 634
900
20
AC
32
Quarry
1000
T 9 N
T 8 N
KEY
19



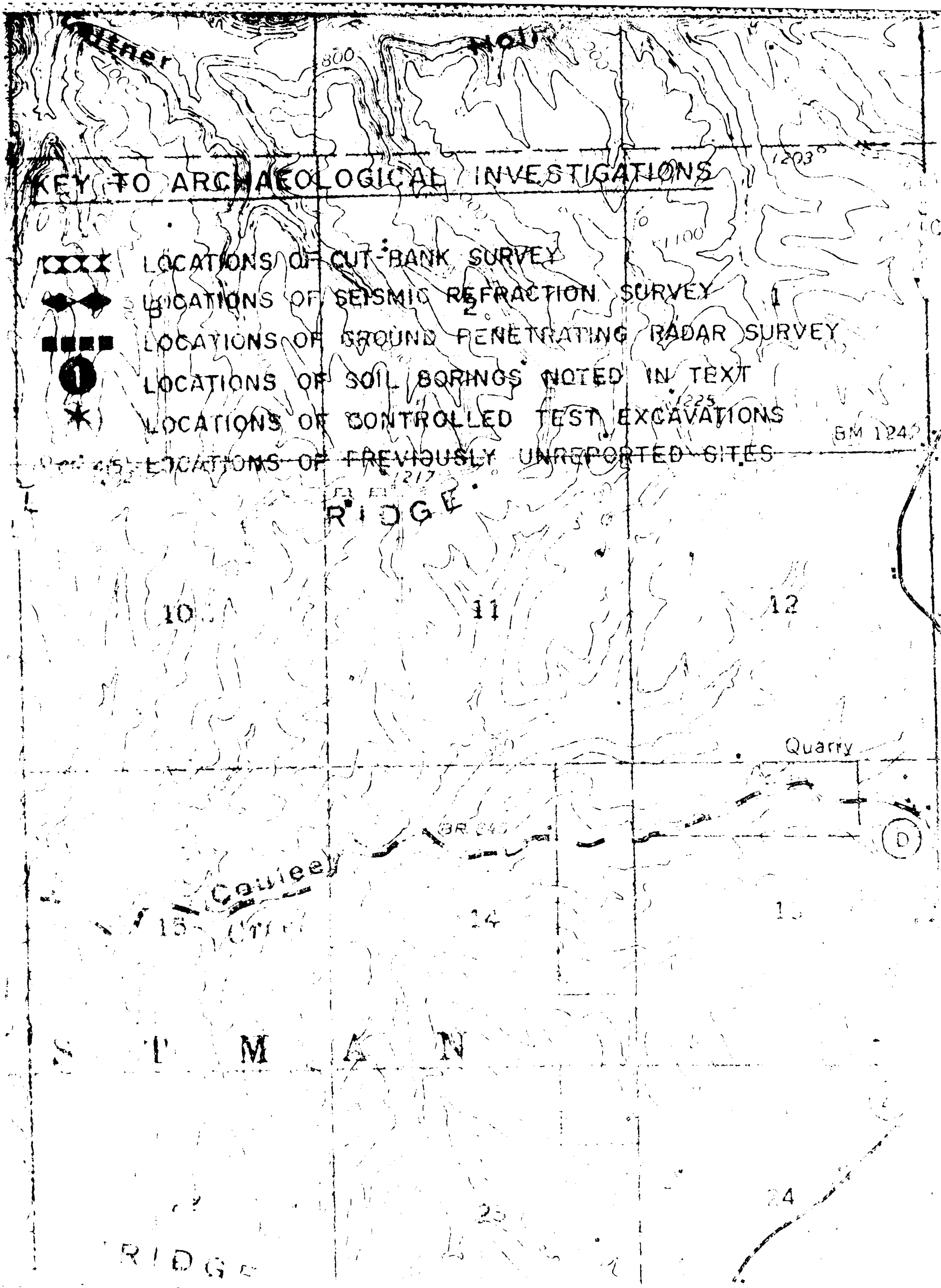
LA CROSSE 43 MI.
FERRYVILLE 8 MI.
E
R. 6 W.
656
657
Mile 651
Mile 650
35
ALLAMAKEE CO
CRAWFORD CO
POOL ELEV 620
Lynxville
(BM 638)
Quarry
SENE
Wayside Park
Radio Tower
Island
Hollow
1149
1188
1063
KEY TO ARCHAEOLOGICAL INVESTIGATIONS
LOCATIONS OF CUT-BANK SURVEY
LOCATIONS OF SEISMIC REFRACTION SURVEY

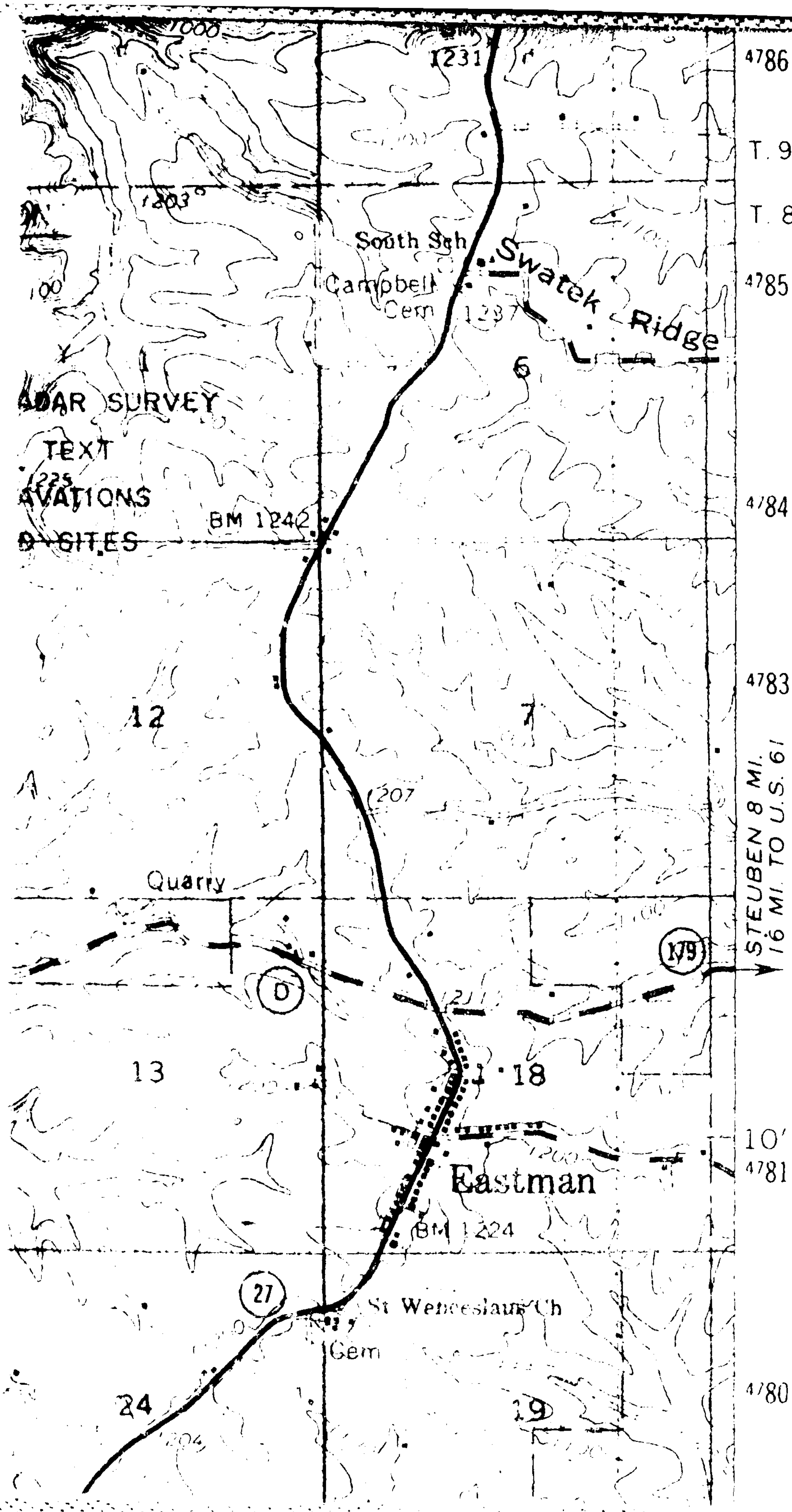


3 MI.
8 MI.
E
R. 6 W.
1 730 000 FEET (WIS.)
R. 5 W.
662
4790
Morgan
Hollow
1000
900
1069
24
19
Spring
S E N E C A
25
30
197
SENECA 3.7 MI.
VIROQUA 29 MI.
450 000 FEET
(WIS.)
4787
1196
F
36
31
BM
1231
4786
T. 9 N.
IGATIONS

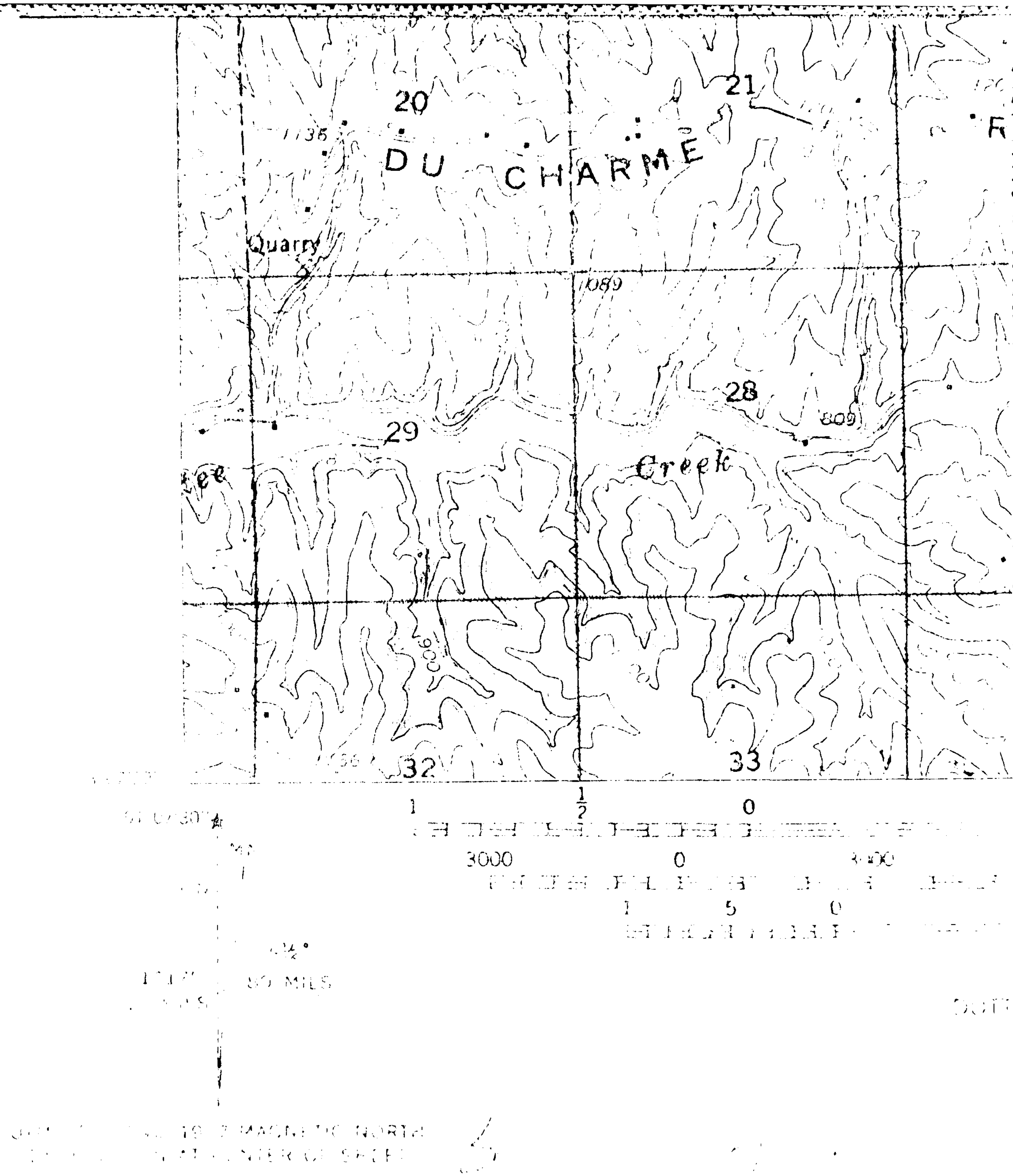


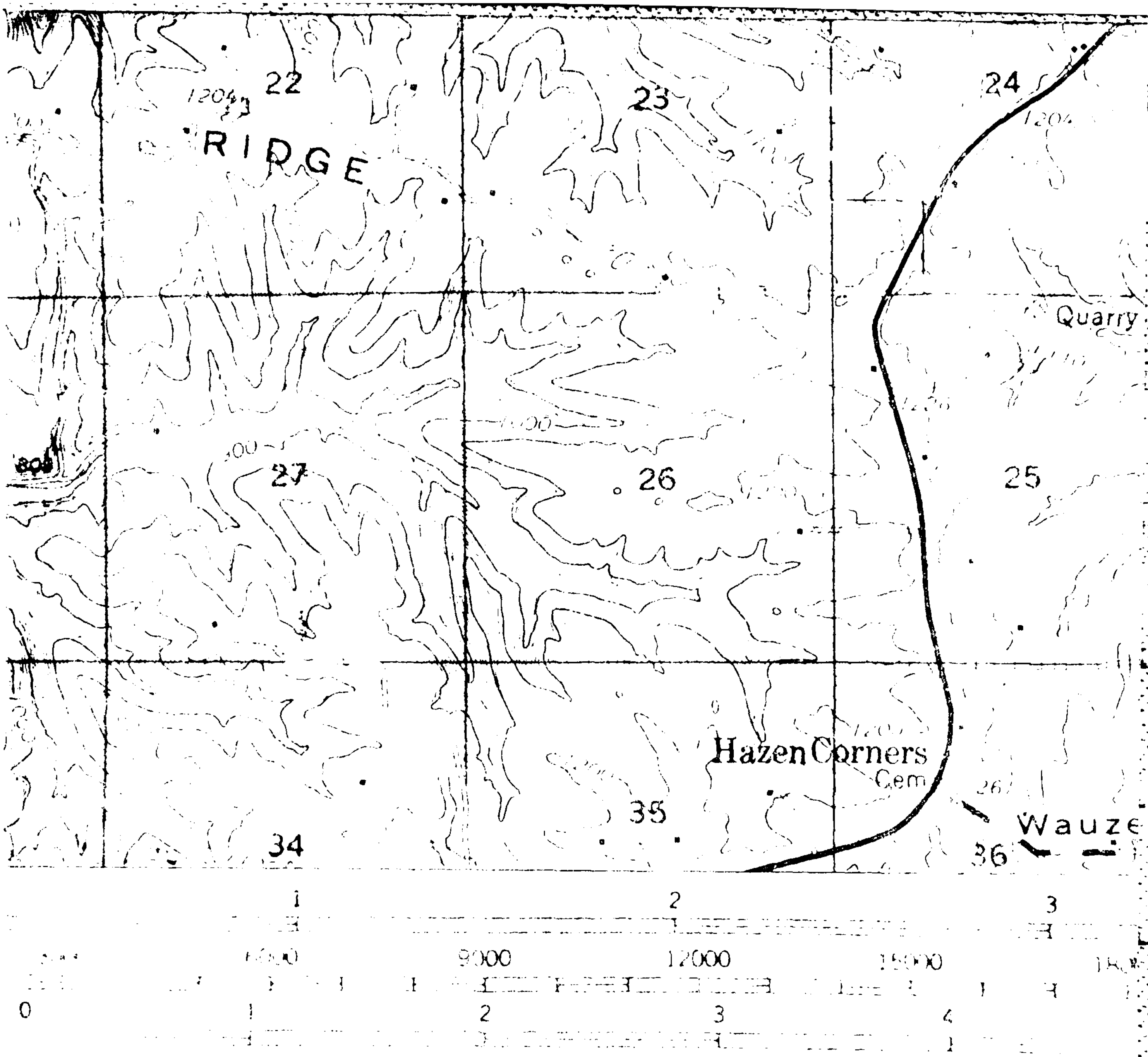
Quarry
T9N
T8N
KEY TO ARC
LOCATI
LOCATI
LOCATI
LOCATI
LOCATI
CR 415 LOCATI
LEGEND
TRIBUTARY FLOODPLAIN
LATERAL ACCRETION RIDGE
VERTICAL ACCRETION DEPOSIT OVER TRIBUTARY FLOODPLAIN
Sioux
E A S T
RIDG


KEY TO ARCHAEOLOGICAL INVESTIGATIONS
LOCATIONS OF CUT-BANK SURVEY
LOCATIONS OF SEISMIC REFRACTION SURVEY
LOCATIONS OF GROUND PENETRATING RADAR SURVEY
LOCATIONS OF SOIL BORINGS NOTED IN TEXT
LOCATIONS OF CONTROLLED TEST EXCAVATIONS
LOCATIONS OF PREVIOUSLY UNREPORTED SITES
800
1203
1100
1225
1217
RIDGE
10
11
12
Quarry
D
Coulee
15
14
M
A
N
24
RIDGE

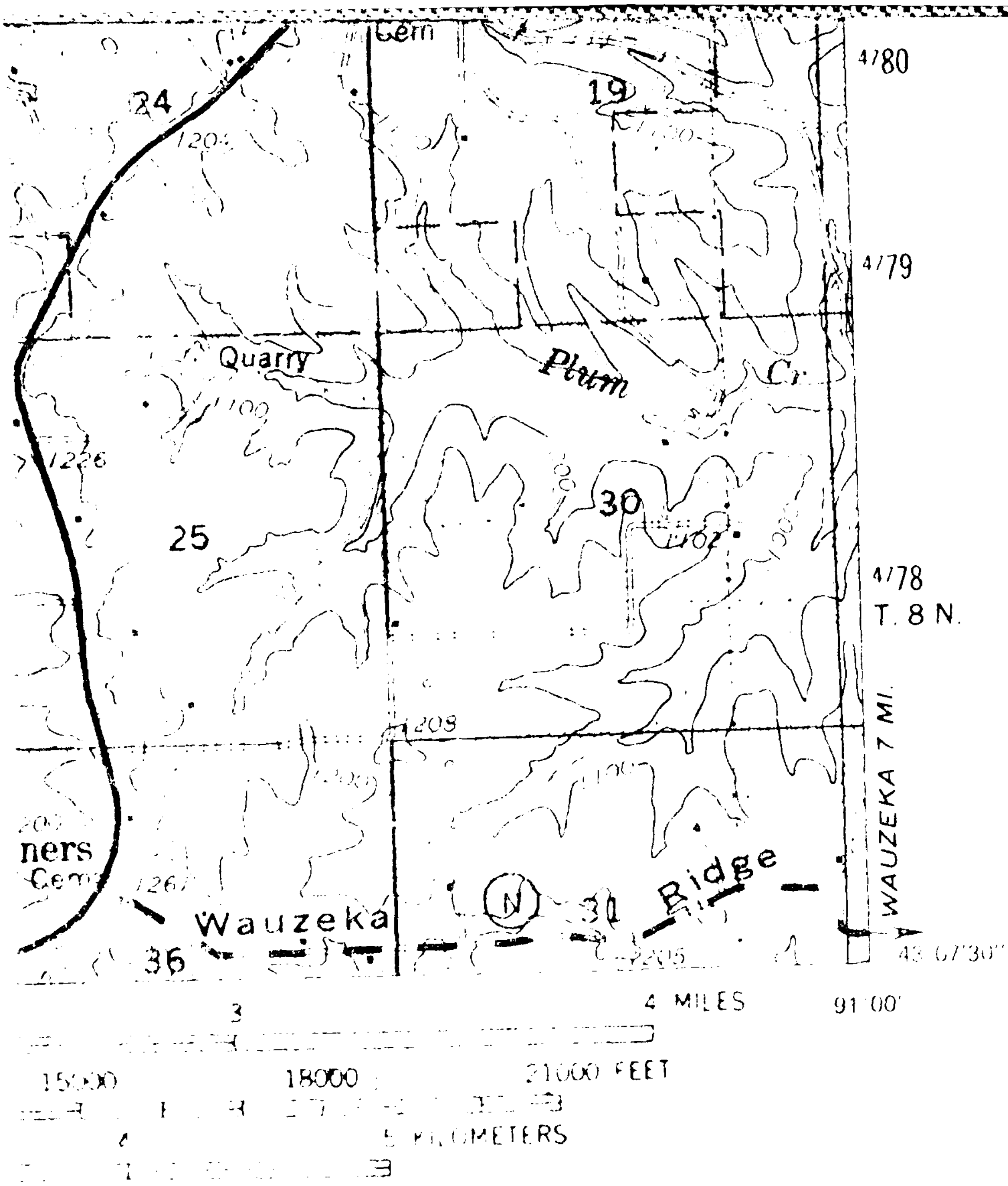


1000
1231
4786
T. 9 N.
T. 8 N.
1203
South Sch
Swatek Ridge
Campbell
Cem
1237
4785
6
ADAR SURVEY
TEXT
1225
AVATIONS
BM 1242
D SITES
4784
4783
12
7
1207
Quarry
D
179
STEUBEN 8 MI.
16 MI. TO U.S. 61
13
18
10′
4781
Eastman
BM 1224
27
St Wenceslaus Ch
Cem
4780
24
19


20
21
DU CHARME
Quarry
1089
28
809
29
Creek
900
32
33
3000
0
MAGNETIC NORTH

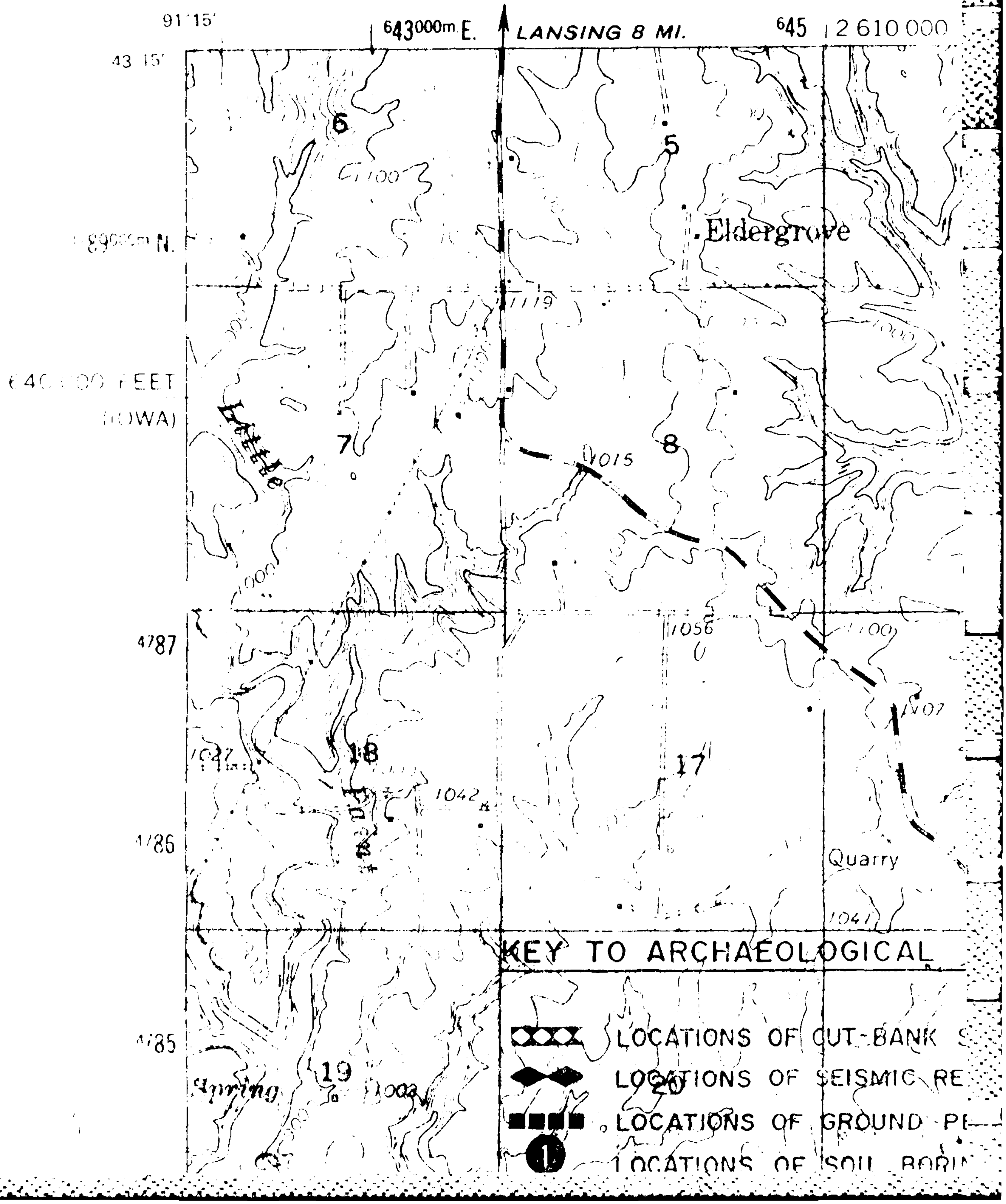


CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

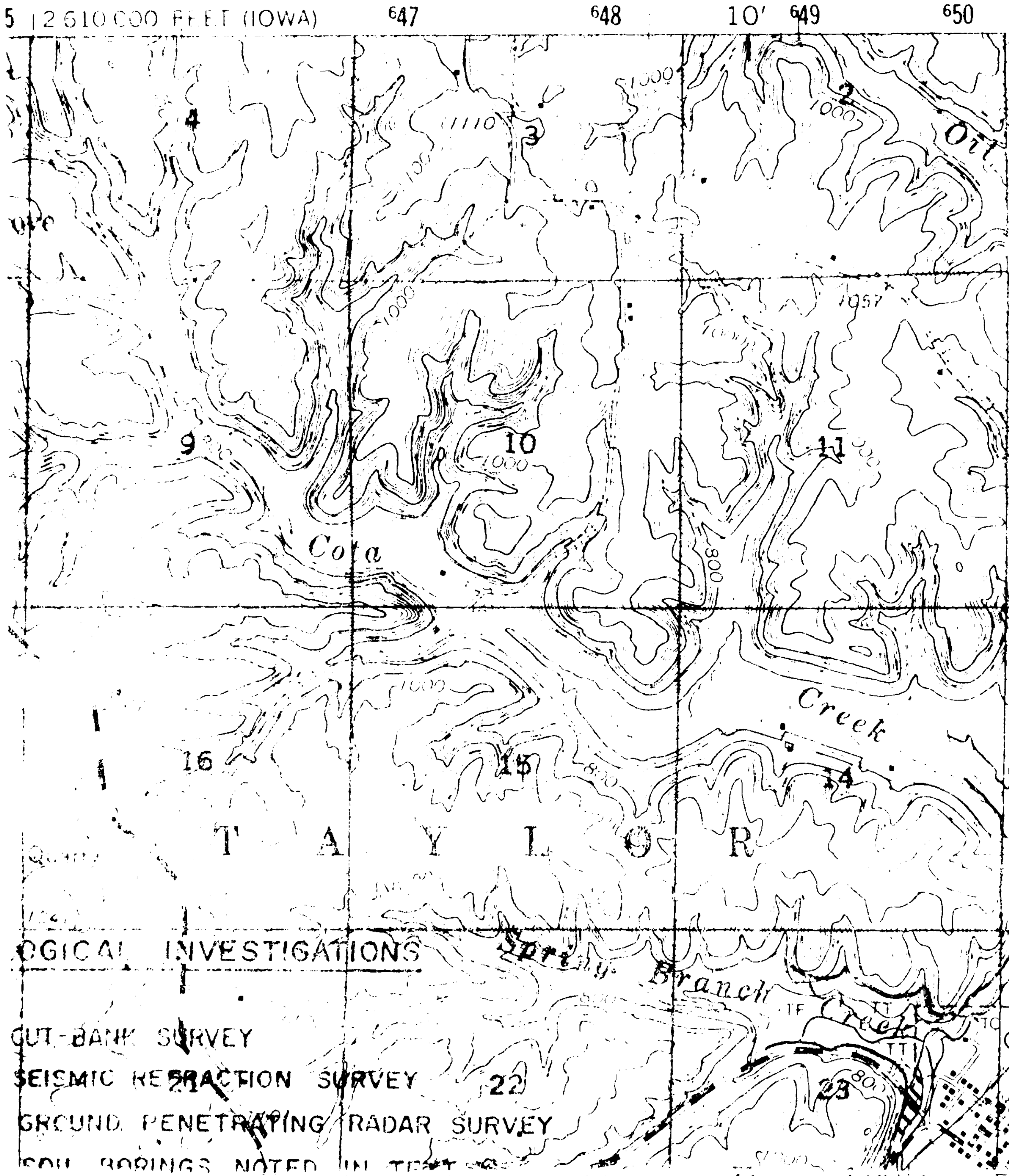


GEOMORPHOLOGY OF POOL 10
PRAIRIE DU CHIEN NE
PLATE 2

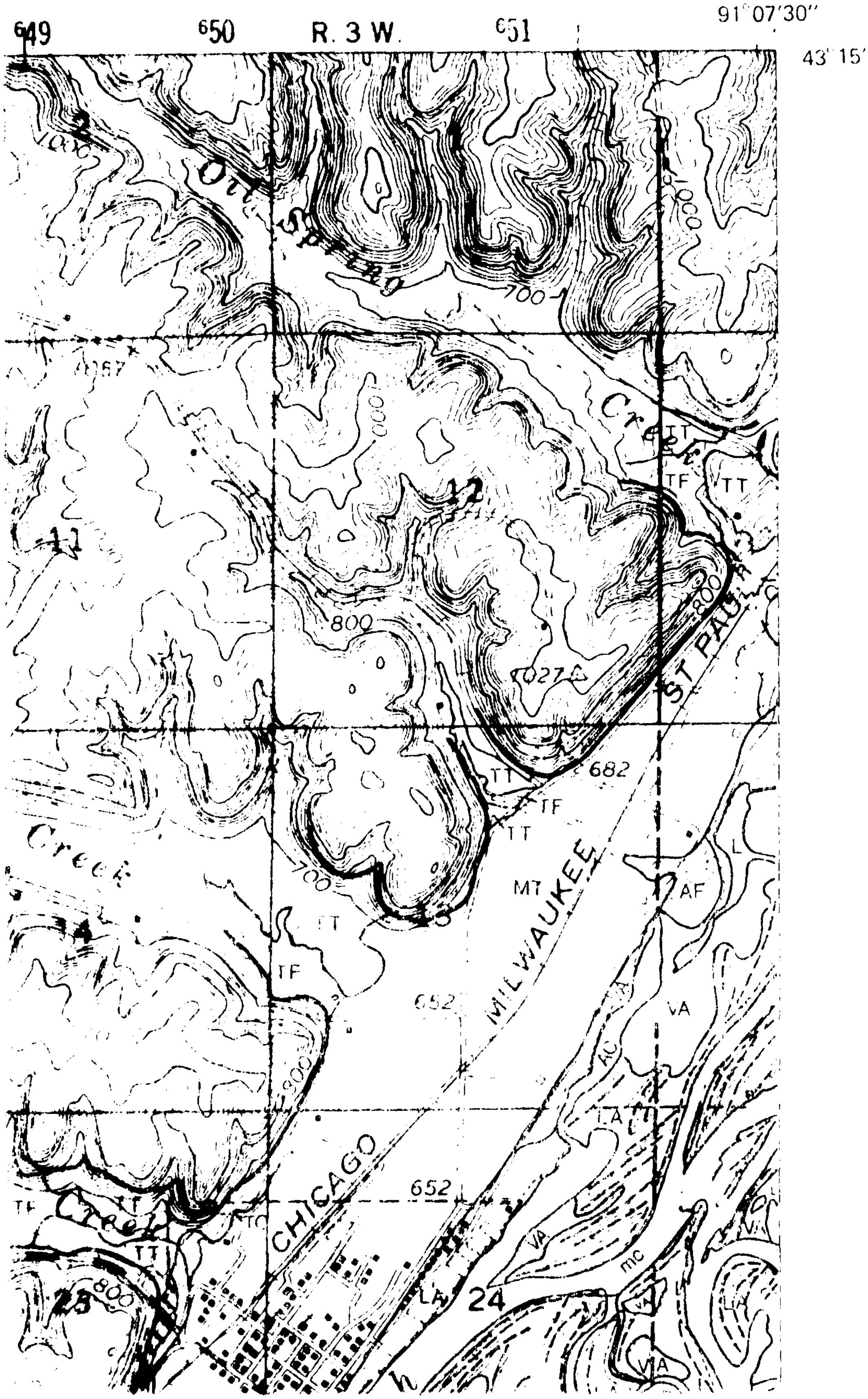
149

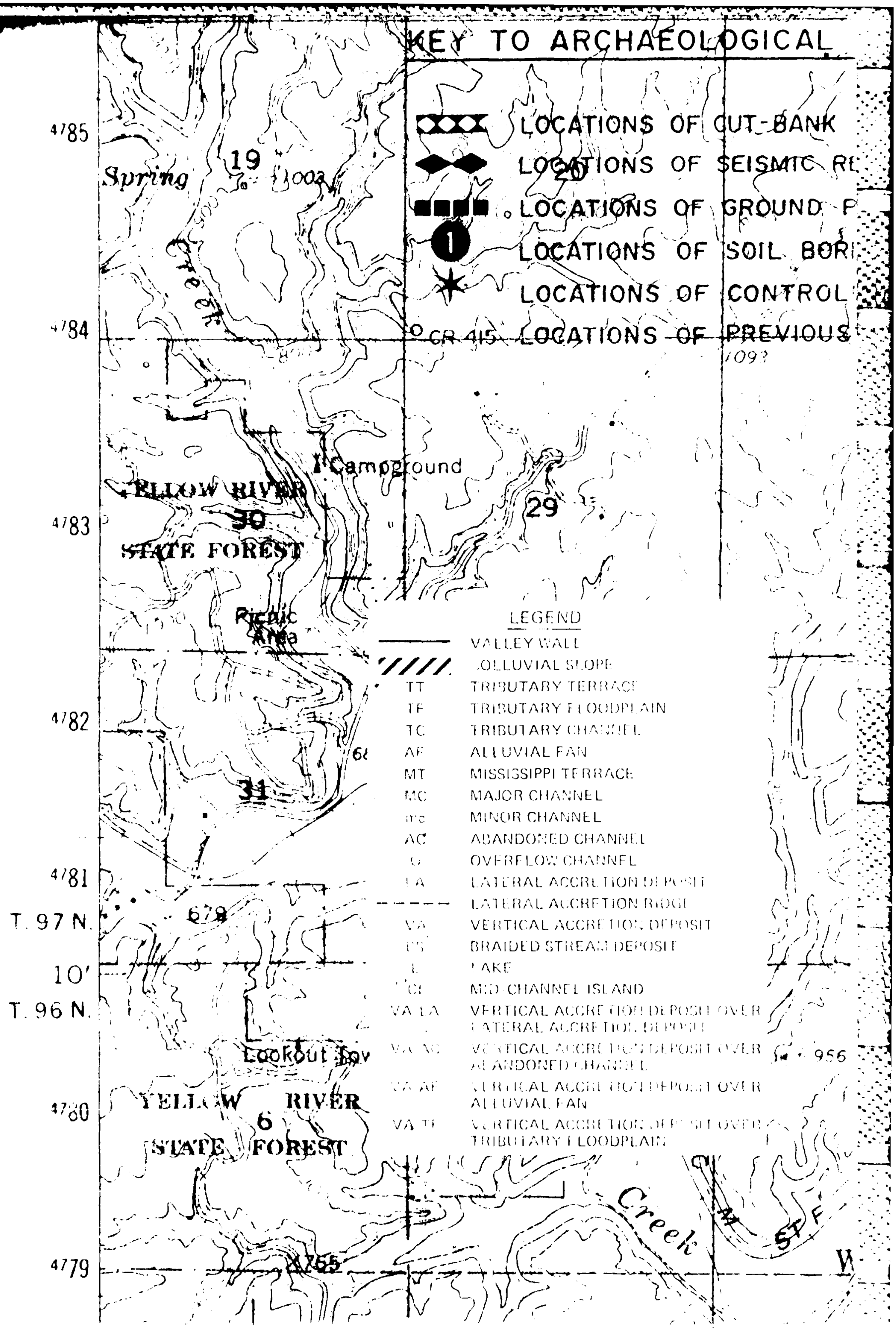


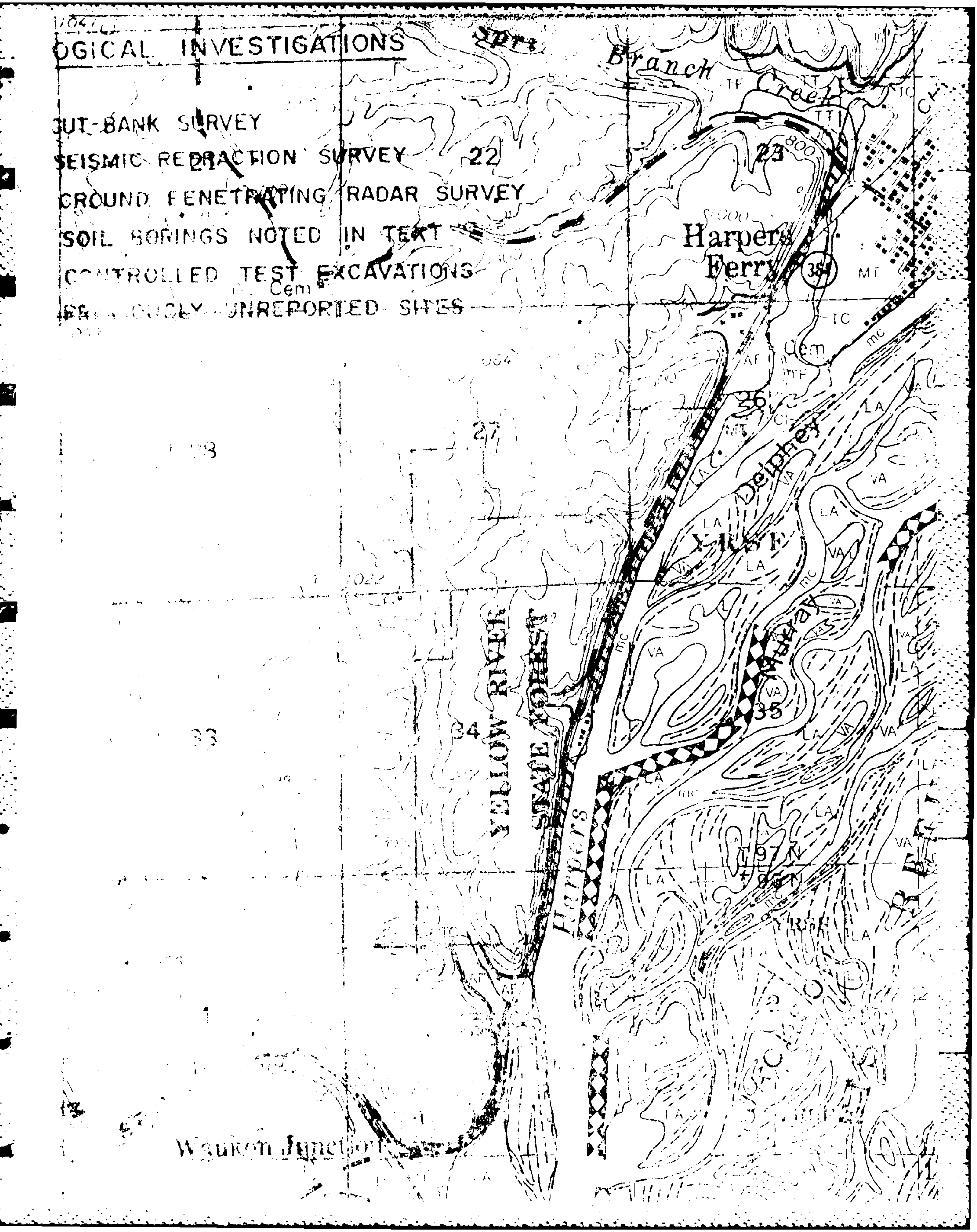
91°15'
643000m E.
LANSING 8 MI.
645
2 610 000
43°15'
Eldergrove
640 000 FEET (IOWA)
Little
4787
4786
4785
Quarry
Spring
1100
1119
1015
1056
1000
1042
1041
1003
1027
6
5
7
8
18
17
19
20
KEY TO ARCHAEOLOGICAL
LOCATIONS OF CUT-BANK S
LOCATIONS OF SEISMIC RE
LOCATIONS OF GROUND PE
LOCATIONS OF SOIL BORIN



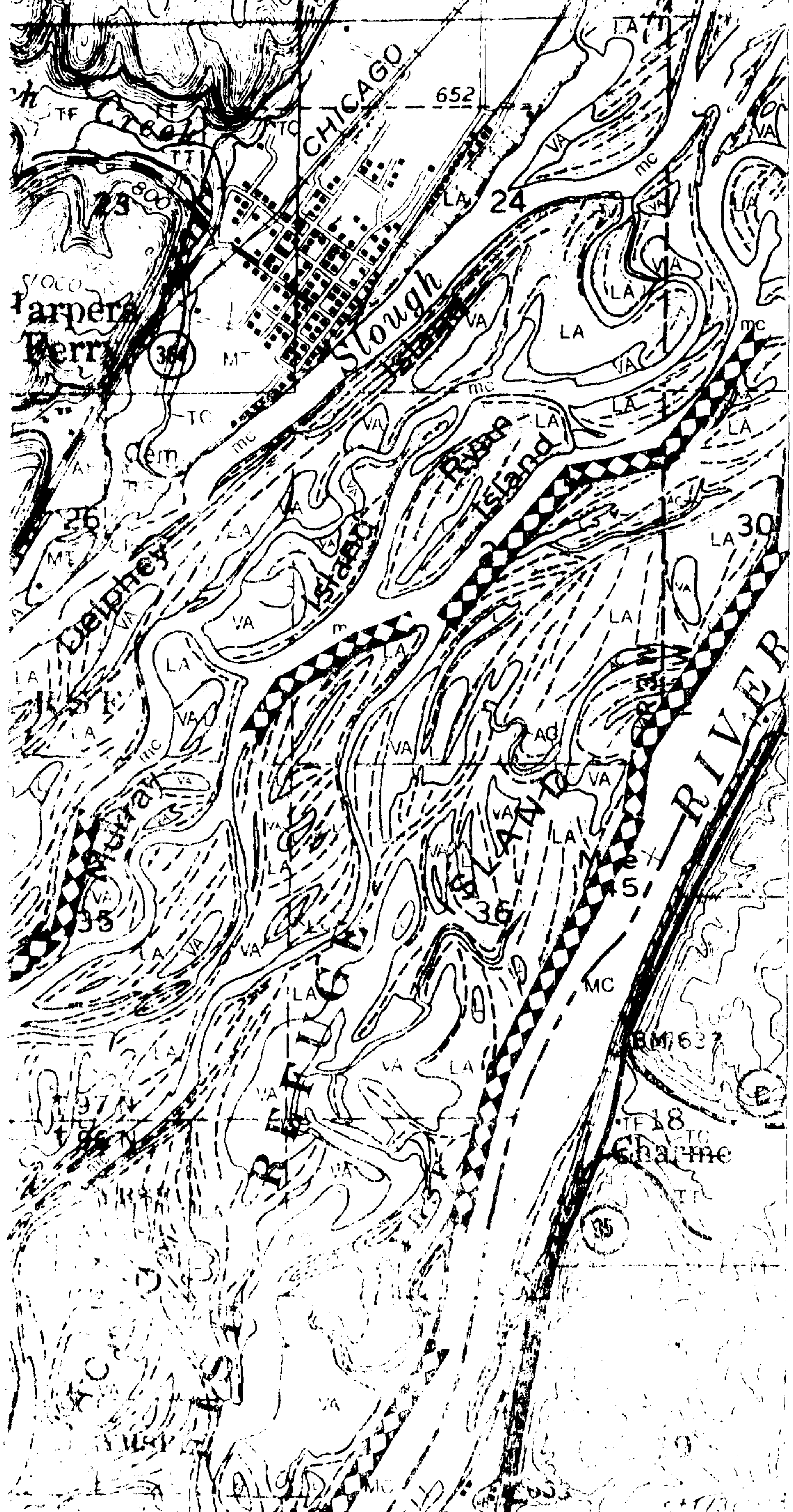
5 | 2 610 000 FEET (IOWA)
647
648
10′
649
650
4
3
2
Oil
1000
1057
9
10
11
Cota
800
Creek
16
15
14
T A Y L O R
OGICAL INVESTIGATIONS
Spring
Branch
CUT-BANK SURVEY
SEISMIC REFRACTION SURVEY
GROUND PENETRATING RADAR SURVEY
21
22
23


649
650
R. 3 W.
651
91°07'30"
43°15'
2
Oil Spring
700
1000
Creek
TT
TF
11
12
800
1027
ST PAUL
682
MILWAUKEE
MT
AF
L
Creek
14
TF
652
VA
AC
LA
CHICAGO
652
TC
23
24
mc

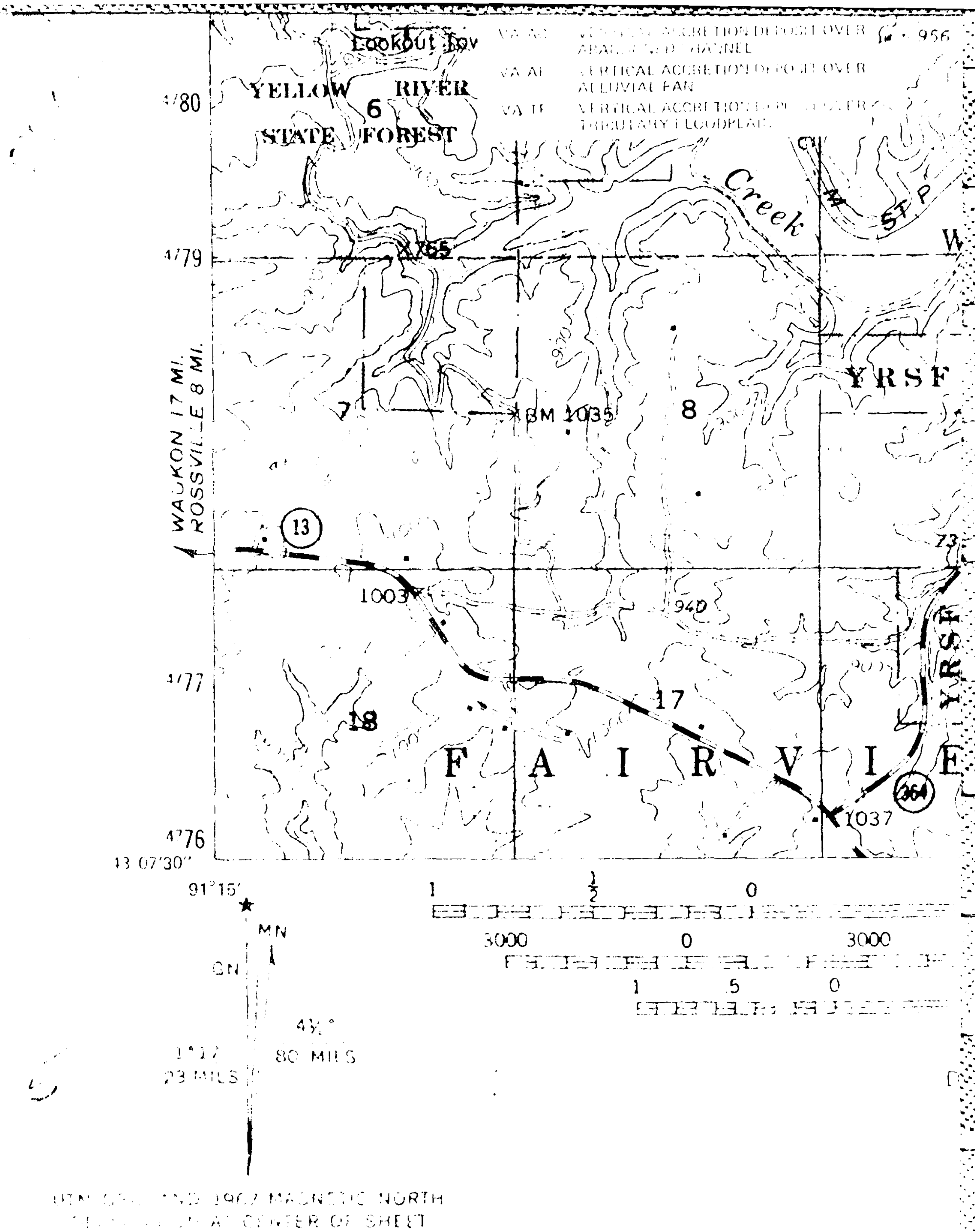

KEY TO ARCHAEOLOGICAL
LOCATIONS OF CUT-BANK
LOCATIONS OF SEISMIC R
LOCATIONS OF GROUND P
LOCATIONS OF SOIL BOR
LOCATIONS OF CONTROL
CR 415 LOCATIONS OF PREVIOUS
LEGEND
VALLEY WALL
COLLUVIAL SLOPE
TT TRIBUTARY TERRACE
TF TRIBUTARY FLOODPLAIN
TC TRIBUTARY CHANNEL
AF ALLUVIAL FAN
MT MISSISSIPPI TERRACE
MC MAJOR CHANNEL
mc MINOR CHANNEL
AC ABANDONED CHANNEL
OVERFLOW CHANNEL
LA LATERAL ACCRETION DEPOSIT
LATERAL ACCRETION RIDGE
VA VERTICAL ACCRETION DEPOSIT
BRAIDED STREAM DEPOSIT
L LAKE
MID-CHANNEL ISLAND
VA LA VERTICAL ACCRETION DEPOSIT OVER LATERAL ACCRETION DEPOSIT
VERTICAL ACCRETION DEPOSIT OVER ABANDONED CHANNEL
VA AF VERTICAL ACCRETION DEPOSIT OVER ALLUVIAL FAN
VA TF VERTICAL ACCRETION DEPOSIT OVER TRIBUTARY FLOODPLAIN
4785
4784
4783
4782
4781
4780
4779
T. 97 N.
10′
T. 96 N.
Spring
Creek
19
20
29
30
31
6
Campground
Picnic Area
YELLOW RIVER STATE FOREST
Lookout
678
765
956
Creek


OGICAL INVESTIGATIONS
CUT-BANK SURVEY
SEISMIC REFRACTION SURVEY
GROUND PENETRATING RADAR SURVEY
SOIL BORINGS NOTED IN TEXT
CONTROLLED TEST EXCAVATIONS
UNREPORTED SITES
Branch
Creek
Harpers
Ferry
Delphey
Murray
YELLOW RIVER
STATE FOREST
Harpers
Waukon Junction
22
23
26
27
34
35
Cem

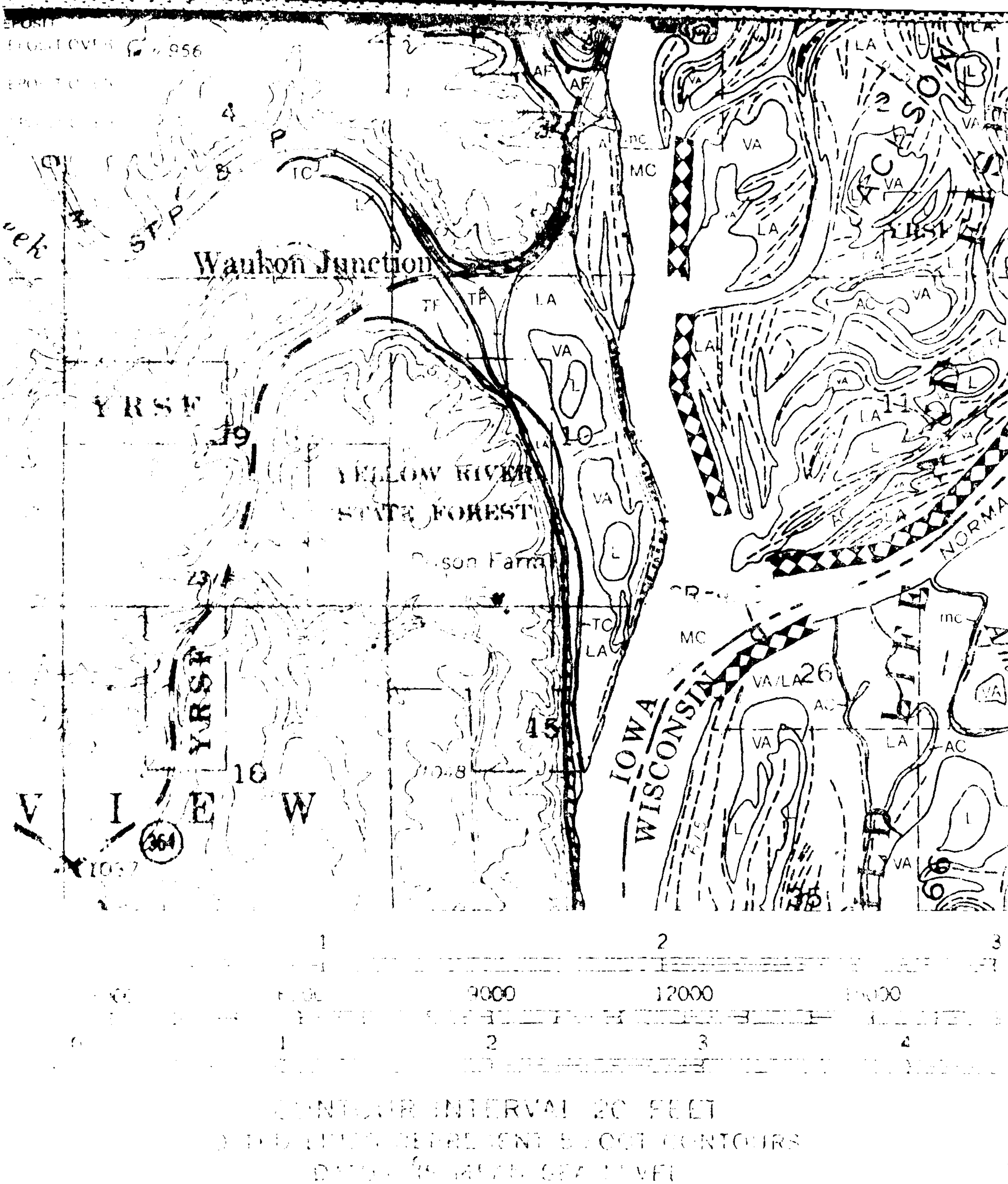
639



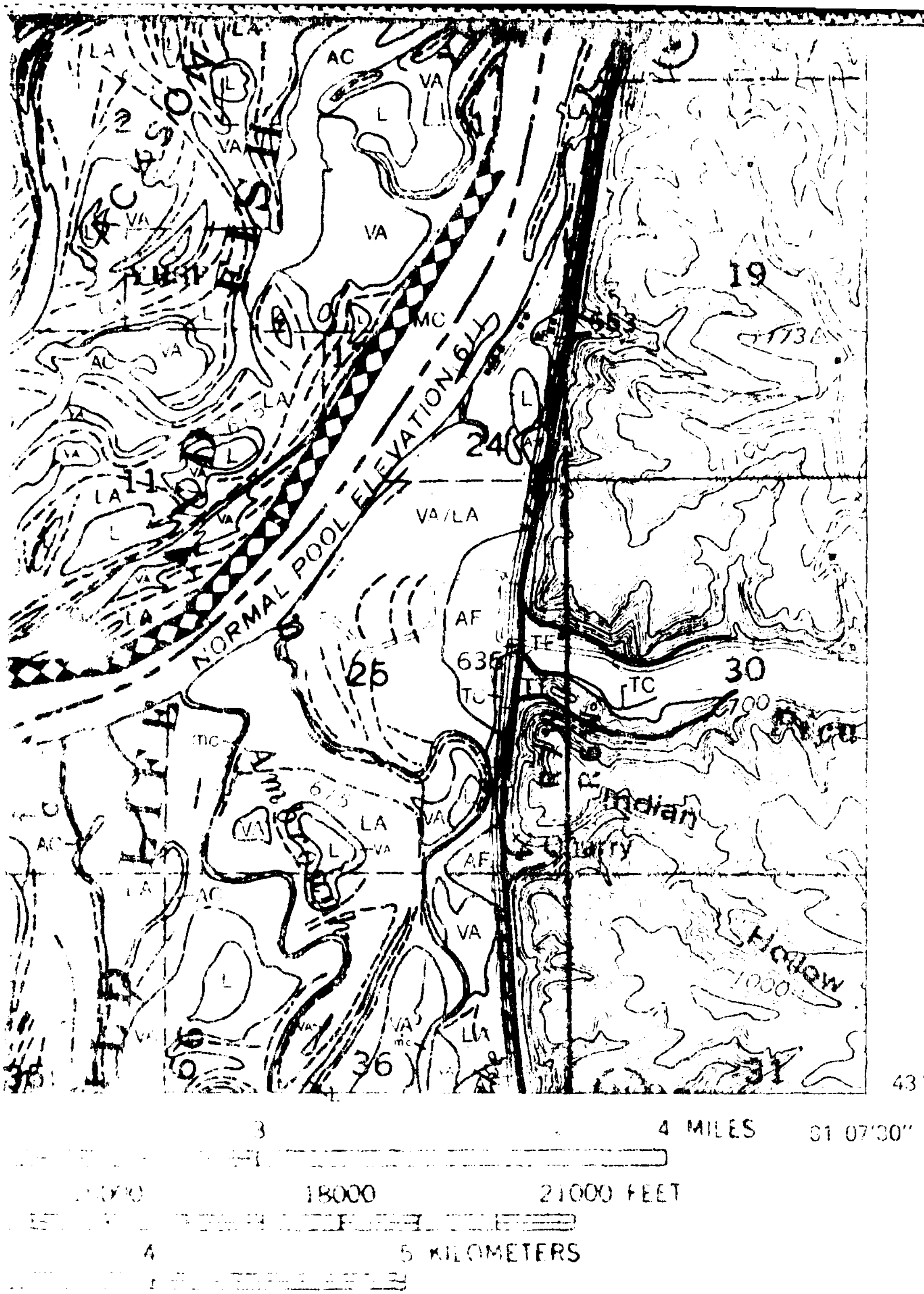
CHICAGO
652
Harpers Ferry
Slough
Ryan Island
Delphey
Murray
RIVER
24
30
35
18
BM 637
LA
VA
mc



Lookout Tow
YELLOW RIVER
STATE FOREST
6
VA AF
VERTICAL ACCRETION DEPOSIT OVER
ALLUVIAL FAN
956
4780
4779
X765
Creek
W
YRSF
7
BM 1035
8
WAUKON 17 MI.
ROSSVILLE 8 MI.
13
73
1003
940
4777
17
18
F A I R V I E
364
1037
4776
43 07'30"
91°15'
1
½
0
3000
0
3000
1
.5
0
MN
GN
4½°
80 MILS
1°17'
23 MILS



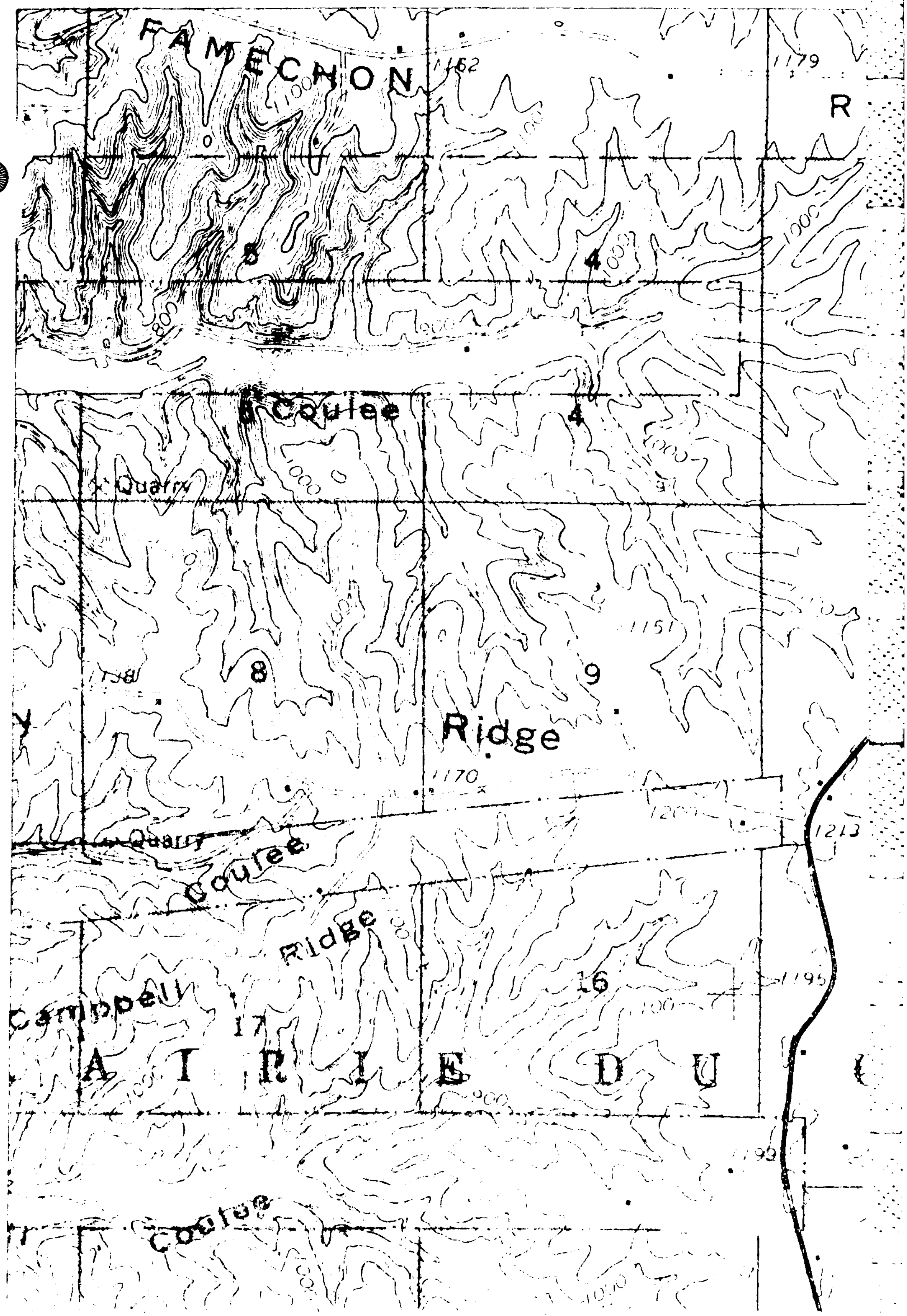
Waukon Junction
YRSF
YELLOW RIVER
STATE FOREST
VIEW
IOWA
WISCONSIN
NORMA
VA
LA
AC
MC
TC
TF
AF
L
9000
12000
CONTOUR INTERVAL 20 FEET

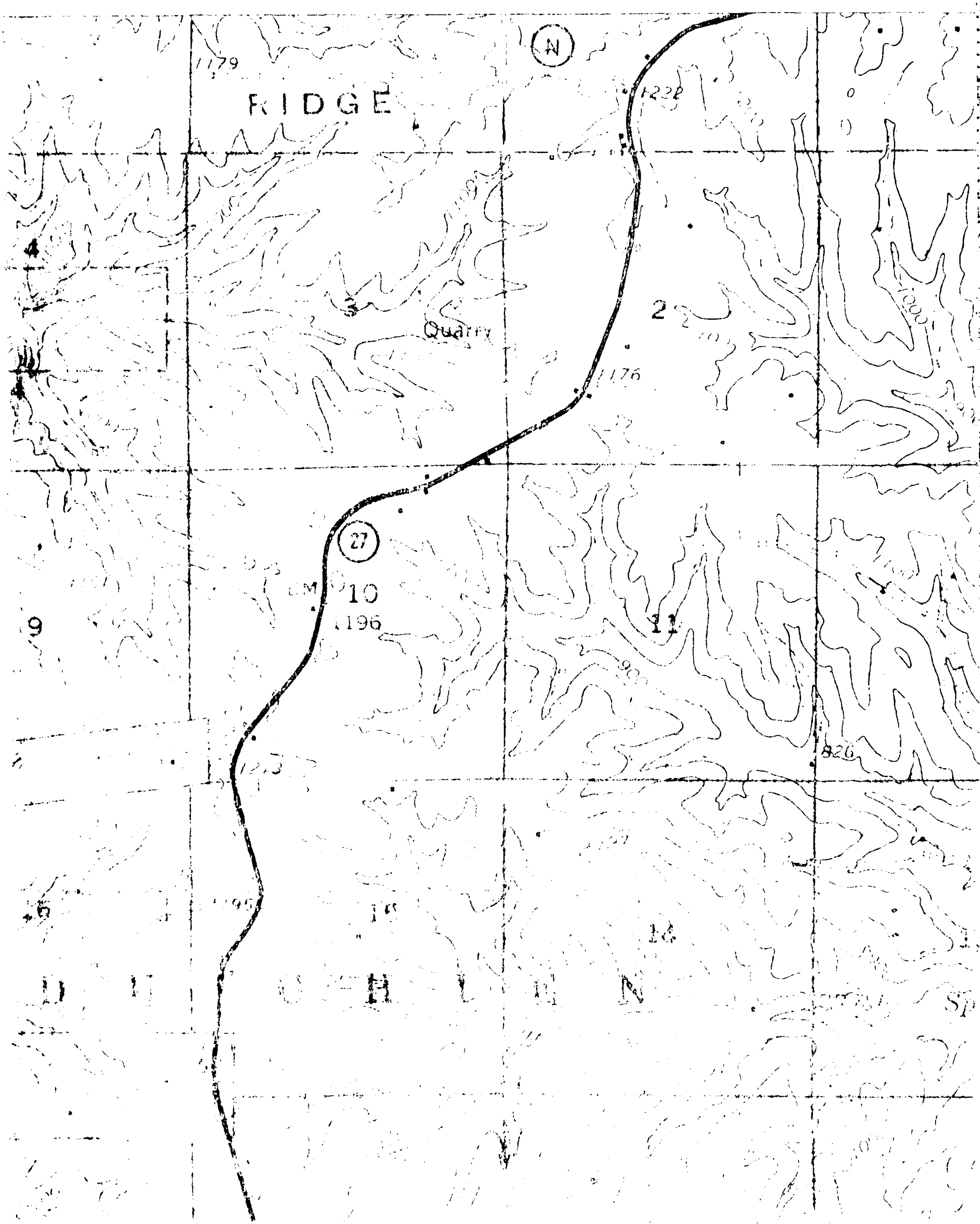


GEOMORPHOLOGY OF POOL 10
PRAIRIE DU CHIEN NW
PLATE 1

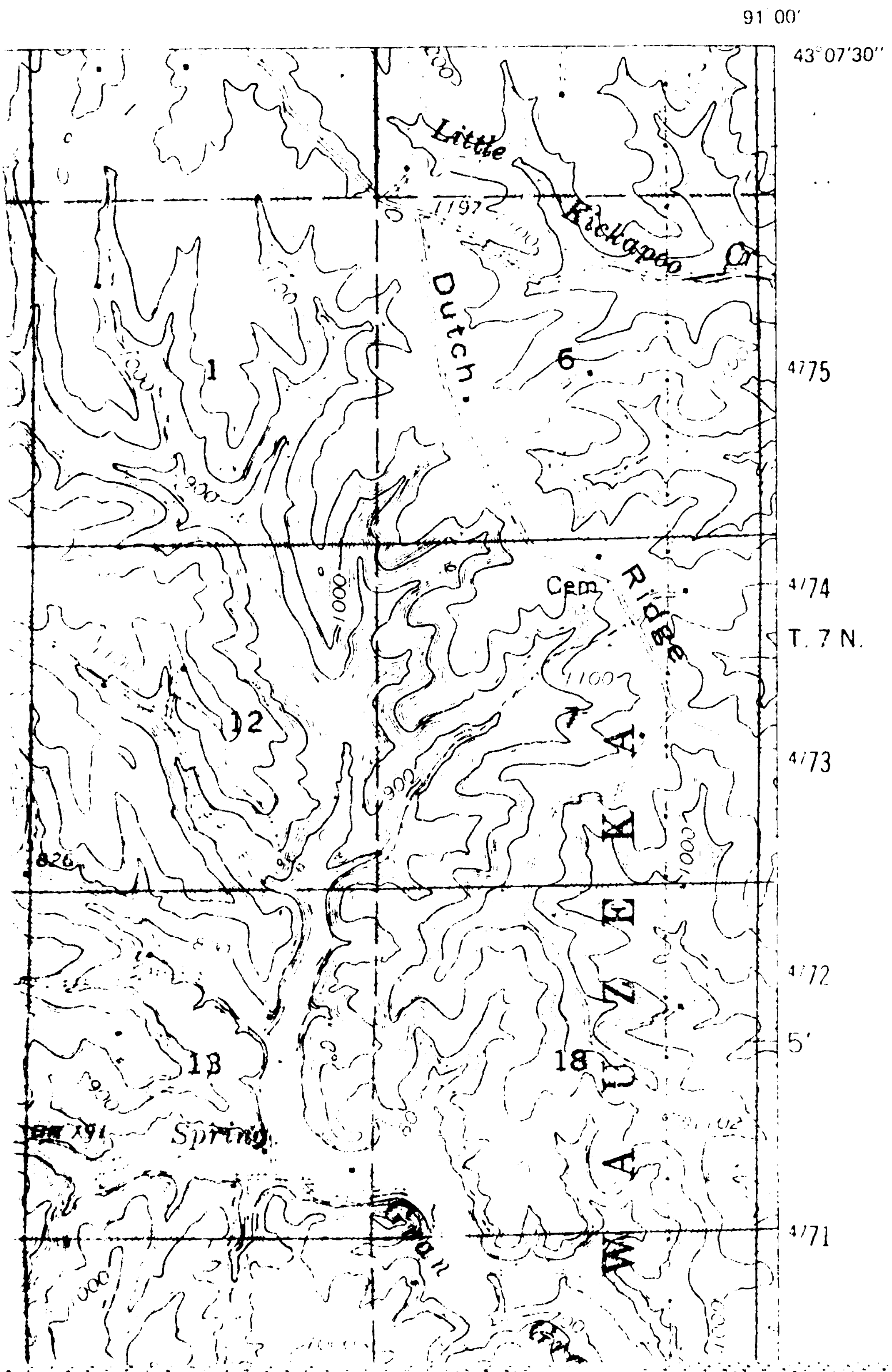
91°07'30"

43°07'30"

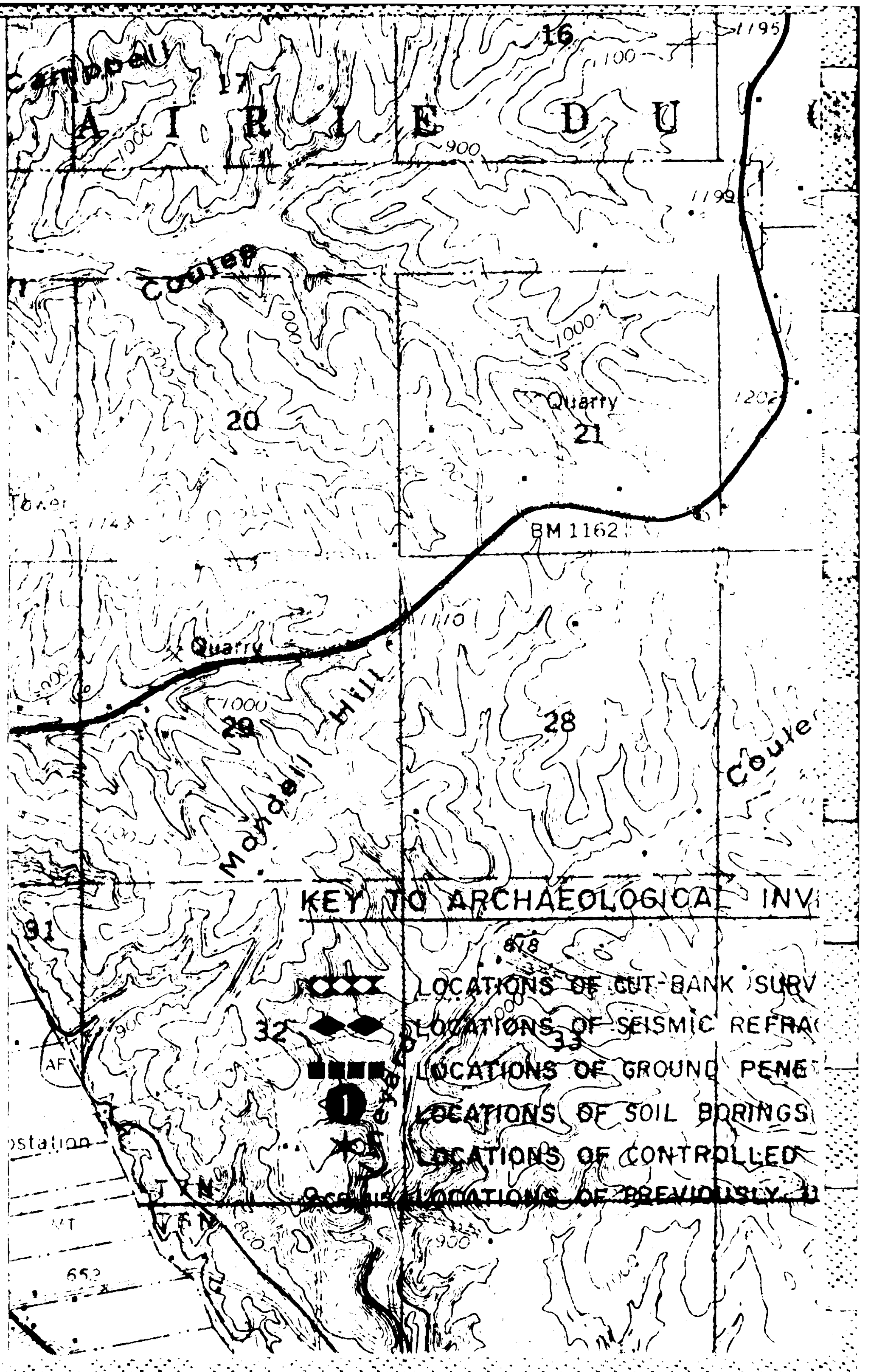




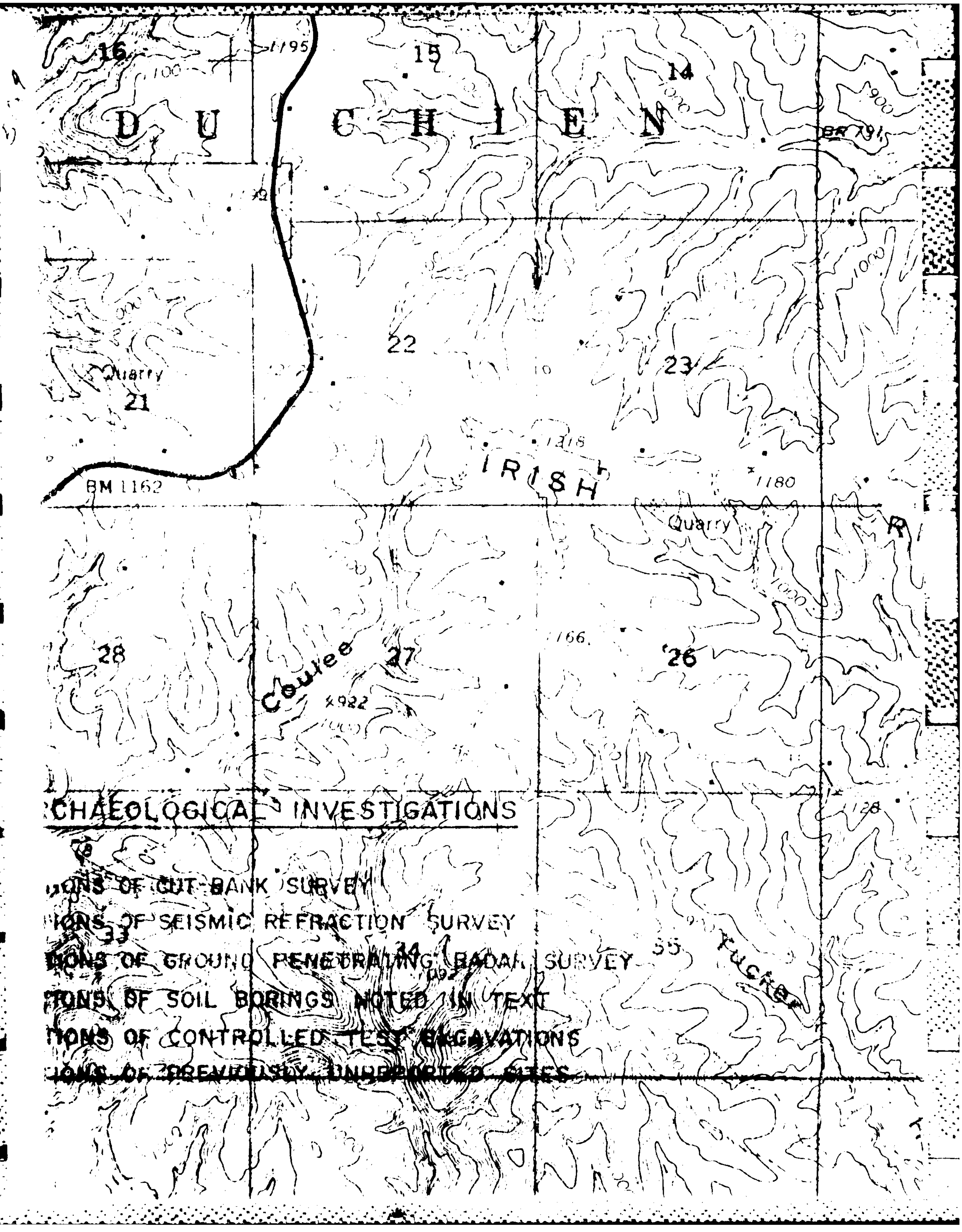
N
RIDGE
1179
1228
4
3
Quarry
2
1000
1176
27
10
1196
9
11
826



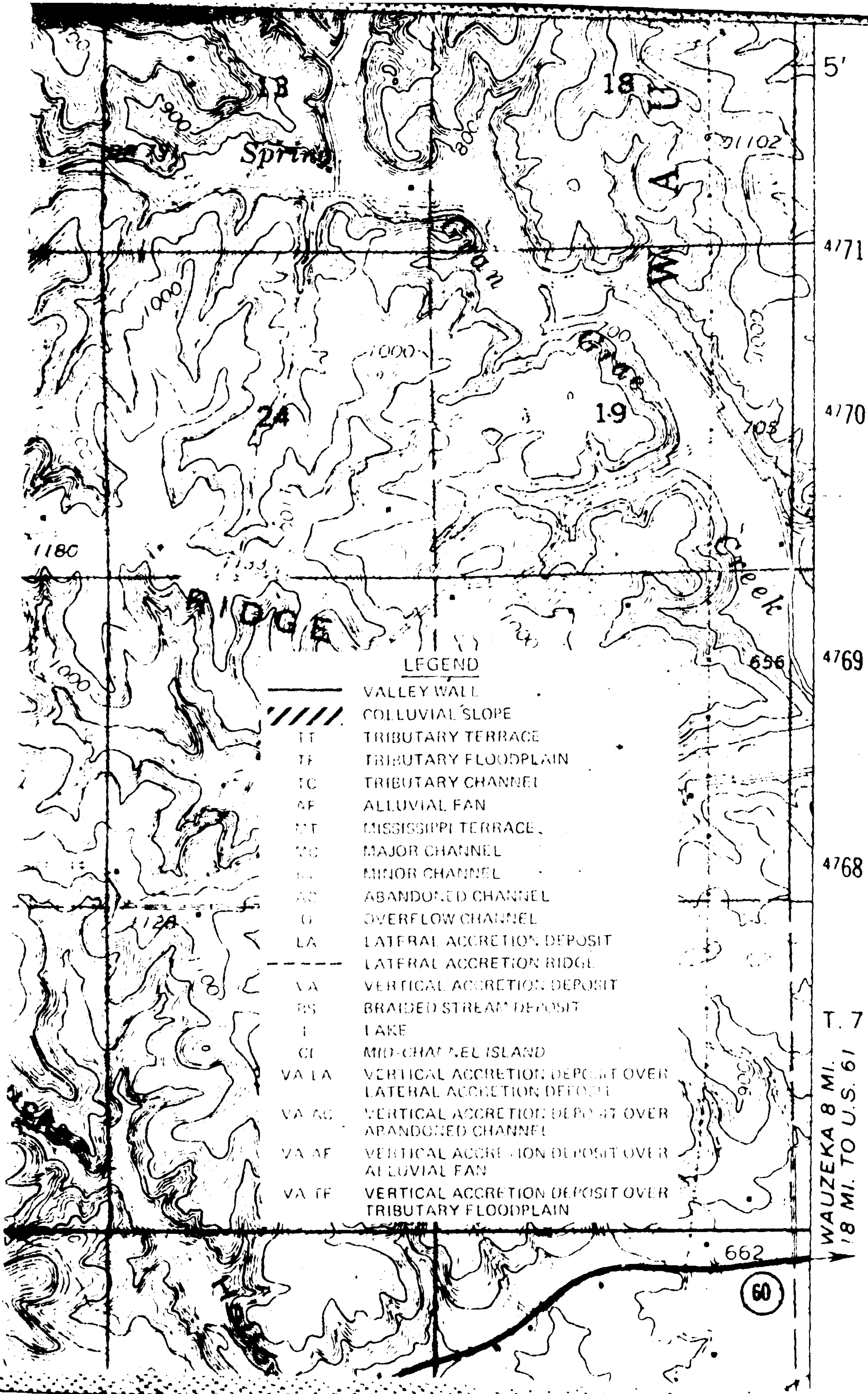
91°00′
43°07′30″
Little
Kickapoo
Dutch
Ridge
Cem
1
6
12
13
18
1197
1100
1000
900
826
Spring
4775
4774
T. 7 N.
4773
4772
5′
4771
K
A
W
E
K



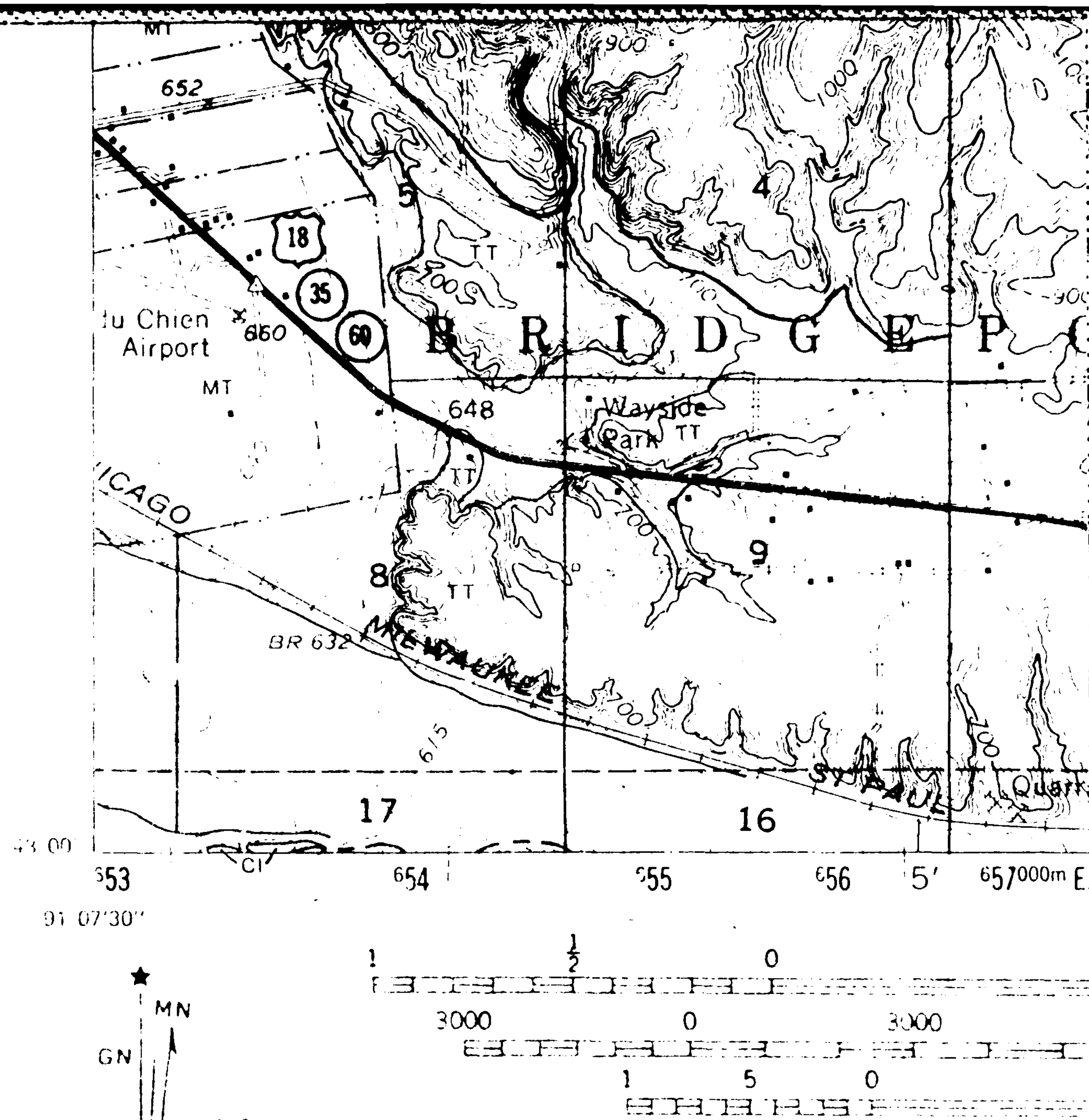
Campbell
17
16
A I R I E D U
1000
900
1195
1199
Coulee
20
21
Quarry
1202
1000
Tower
BM 1162
Quarry
1110
1000
29
28
Mandell Hill
Coulee
KEY TO ARCHAEOLOGICAL INV
LOCATIONS OF CUT-BANK SURV
LOCATIONS OF SEISMIC REFRA
LOCATIONS OF GROUND PENE
LOCATIONS OF SOIL BORINGS
LOCATIONS OF CONTROLLED
LOCATIONS OF PREVIOUSLY
32
33
31
900
AF
station
T N
T N
800
900
653

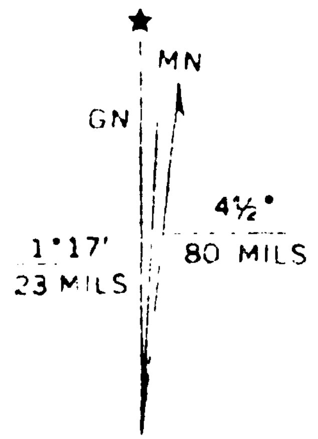

16
15
14
D U C H I E N
1195
1000
900
22
23
21
Quarry
1318
IRISH
1180
BM 1162
Quarry
1000
28
Coulee
27
26
1166
922
CHAEOLOGICAL INVESTIGATIONS
IONS OF CUT BANK SURVEY
IONS OF SEISMIC REFRACTION SURVEY
IONS OF GROUND PENETRATING RADAR SURVEY
TIONS OF SOIL BORINGS NOTED IN TEXT
TIONS OF CONTROLLED TEST EXCAVATIONS
33
34
35

699



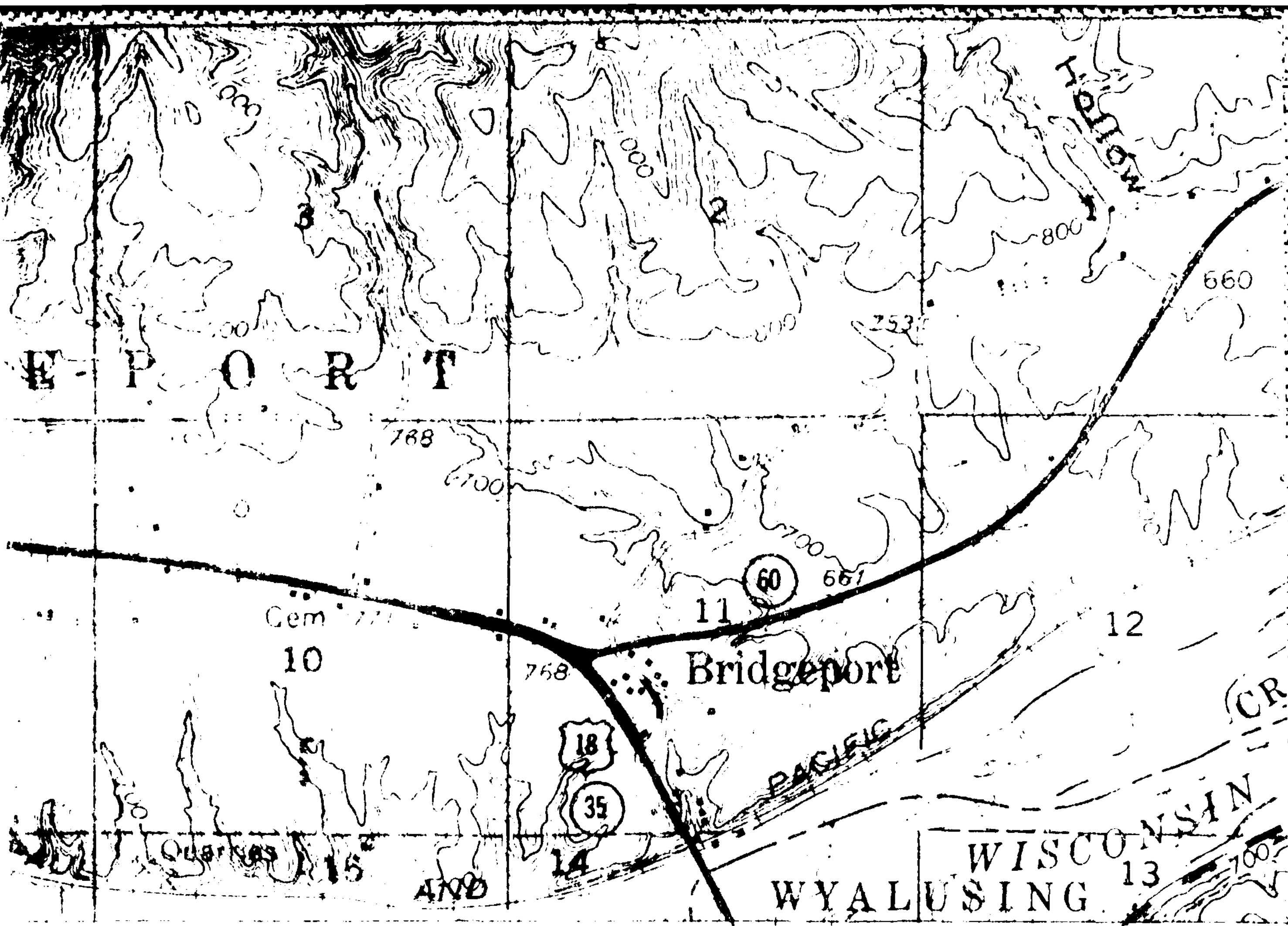
Spring
18
18
1102
900
1000
1000
24
19
705
1180
RIDGE
Creek
656
5'
4771
4770
4769
4768
T. 7 N
WAUZEKA 8 MI.
18 MI. TO U.S. 61
662
60
LEGEND
VALLEY WALL
COLLUVIAL SLOPE
TT TRIBUTARY TERRACE
TF TRIBUTARY FLOODPLAIN
TC TRIBUTARY CHANNEL
AF ALLUVIAL FAN
MISSISSIPPI TERRACE
MAJOR CHANNEL
MINOR CHANNEL
ABANDONED CHANNEL
OVERFLOW CHANNEL
LA LATERAL ACCRETION DEPOSIT
LATERAL ACCRETION RIDGE
VA VERTICAL ACCRETION DEPOSIT
BS BRAIDED STREAM DEPOSIT
L LAKE
CI MID-CHANNEL ISLAND
VA LA VERTICAL ACCRETION DEPOSIT OVER LATERAL ACCRETION DEPOSIT
VA AC VERTICAL ACCRETION DEPOSIT OVER ABANDONED CHANNEL
VA AF VERTICAL ACCRETION DEPOSIT OVER ALLUVIAL FAN
VA TF VERTICAL ACCRETION DEPOSIT OVER TRIBUTARY FLOODPLAIN





UTM GRID AND 1967 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

DOTT



(BAGLEY 1:24 000) INTERIOR—GEOLOGICAL SURVEY

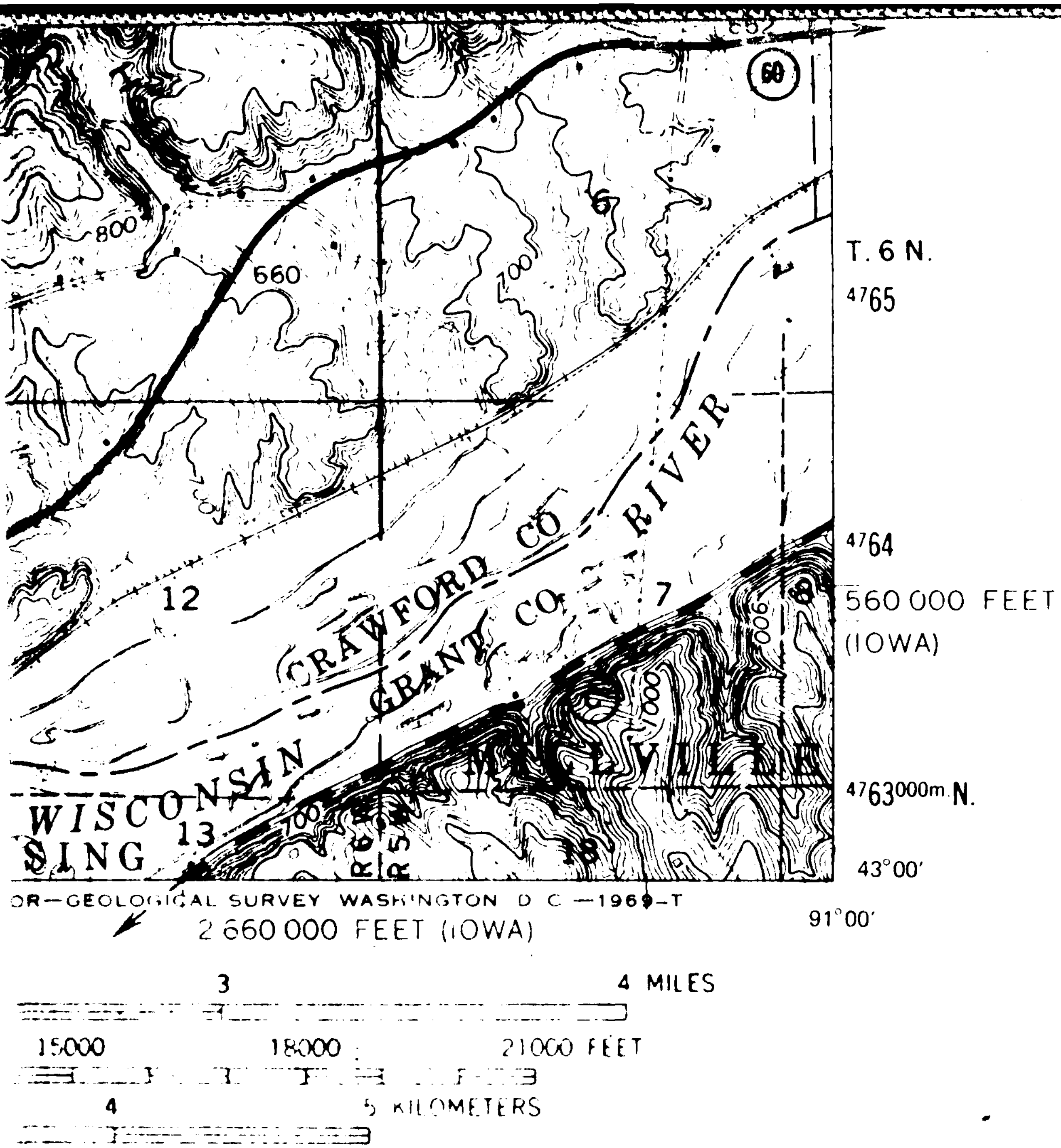
2 660 000

1 2 3

6000 9000 12000 15000 18000

1 2 3 4

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL



GEOMORPHOLOGY OF POOL 10
PRAIRIE DU CHIEN SE
PLATE 4